FINAL REPORT

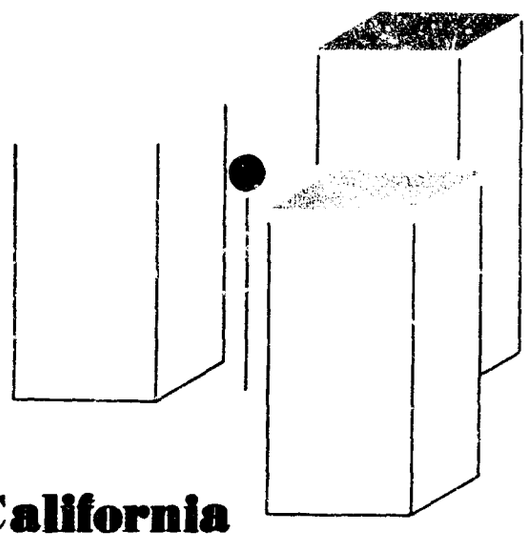
Radiological Recovery Requirements, Structures, and Operations Research

Volume III,

Decontamination

Analysis of Selected Sites

and Facilities in San Jose, California



by

S. M. Walker

PREPARED FOR THE
OFFICE OF CIVIL DEFENSE
DEPARTMENT OF THE ARMY
WASHINGTON, D. C. 20310
OCD WORK UNIT NO. 3233B

UNDER

TECHNICAL MANAGEMENT OFFICE
U. S. NAVAL RADIOLOGICAL DEFENSE LABORATORY
SAN FRANCISCO, CALIFORNIA 94135
CONTRACT N228 (62479)-68153
RTI PROJECT OU-214

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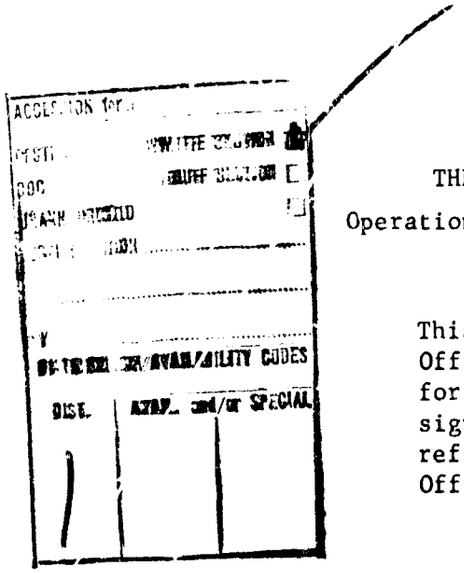

THE RESEARCH TRIANGLE INSTITUTE
Operations Research and Economics Division

FINAL REPORT: Volume III,

Decontamination Analysis of Selected Sites and Facilities in San Jose, California

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6 June 1966

PREFACE

The conclusions given in this report are based upon the "Engineering Manual (PM100-1)" method for calculation of "protection factors". Since an error analysis is not presently available, the conclusions should be regarded as tentative, pending the development of such an analysis. In addition, a redistribution of fallout and/or changes in the γ-ray spectrum emitted by the fallout may introduce further uncertainties into these conclusions.

ACKNOWLEDGEMENTS

The author is pleased to acknowledge the helpful cooperation of A. Russell Lunsford, Deputy Director, San Jose Department of Civil Defense, and the staff in scheduling and participating in the field surveys which were necessary to conduct this study. Appreciation is also extended to Philip McGill and Philip Rasberry for their valuable assistance in obtaining data and photographs in San Jose.

ABSTRACT

This is Volume III of four separately bound volumes that report the research completed under the general terms of the Office of Civil Defense Subtask No. 32333, "Radiological Recovery Requirements, Structures, and Operations Research". This volume contains the supporting data related to decontamination analyses of sixteen sites and facilities from San Jose, California. Volume I describes the general aspects of the investigations and presents the conclusions and recommendations.

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Decontamination Analysis of Selected Sites and Facilities in San Jose, California

I. INTRODUCTION

A. Objectives

This report presents the results of an analysis of the cost and effectiveness of decontamination of selected sites and facilities in San Jose, California. The purpose of this analysis is to:

1. determine the reduction in dose-rate at several detector locations for various strategies of decontamination;
2. determine the reduction in dosage to persons performing operations in the activity area; and
3. compute cost estimates in time and manpower for practical decontamination operations.

These results can then be used to determine the extent to which decontamination can accelerate a postattack recovery.

B. Approach

The method of analysis in this report is basically the same as that used in Initial Considerations for an Analysis of Decontamination Effectiveness in Municipal Areas, (Ref. 1).[1/]

The two basic assumptions underlying the calculation of all of the decontamination effectiveness data remain:

1. the intensity at a specified detector location is linearly and independently related to the intensity contributions from the various contaminated planes. That is, if I_j is the intensity at detector location j, then one may write:

$$I_j = C_1 + C_2 + \ldots + C_r \qquad (1)$$

[1/] J. T. Ryan, Research Triangle Institute (1965)

where the C_i's are the individual contributions from the n contaminated planes which contribute to the intensity at detector location j; and

2. the intensity due to the i^{th} contaminated plane is directly proportional to the amount of fallout material on the i^{th} contaminated plane.

Therefore, the intensity at location j after only the k^{th} area is decontaminated, I_j^k, is given in Eq. (2).

$$I_j^k = I_j - F_k CF_{k,j} I_j \qquad (2)$$

where I_j is the intensity at location j prior to decontamination of plane k; F_k is the fraction of fallout removed from the k^{th} contaminated plane; and $CF_{k,j}$ is the fraction of the total intensity prior to decontamination at detector j due to contaminated plane k. In other words,

$$CF_{k,j} = \frac{\text{pre-decontamination intensity at detector j from } k^{th} \text{ area}}{\text{total pre-decontamination intensity at detector j}}. \qquad (3)$$

Other parameters and symbols used are:

1. RN_j = the intensity reduction factor. This is the fraction of pre-decontamination dose-rate remaining at detector location j after decontamination has been accomplished.

2. RN_A = the activity dose reduction factor. This is the fraction of pre-decontamination dose accumulated by a person performing activity pattern A after decontamination has been accomplished.

The values needed to determine the objectives set forth in I.A. were determined by the use of two computer programs. The C_i values were obtained through the use of the program described in Computer Program for Analysis of Building Protection Factors Parts I and II, (Ref. 2).[2/] This is a FORTRAN program, based on the latest techniques in fallout radiation shielding, which is designed to accurately describe the doses within real structures. The remaining values were determined through the use of the program described in A Fortran Program for Decontamination Analysis, (Ref. 3).[3/]

[2/] E. L. Hill, T. Johnson, and R. O. Lyday, Jr., Research Triangle Institute, (1965)

[3/] C. Dillard and J. Ryan, Research Triangle Institute, (1965)

This program, also written in FORTRAN, is a debugged and tested program for computing the effectiveness parameters used to analyze municipal decontamination. The C_i values were inputs to the latter program.

Where precise blueprints were unavailable, educated assumptions were made regarding structural characteristics of the facilities. However, it is believed that the assumptions made are realistic, and do not bias the results of the analysis to any appreciable degree.

Because of the above lack of information, it was also necessary at times to assume that fallout shelters were available to personnel at the facilities. These shelters were accordingly given realistic C_{ij} values. Although they are considered as detector locations, their locations are not shown on the figures because their exact positions are not specified.

C. Contents

This report contains the compiled results of an analysis of the application of decontamination efforts to numerous sites and facilities in San Jose, California. Figure 1 shows the location of the sites and facilities considered, and the accompanying legend identifies them.

For each of the activity areas, the intensity reductions at a number of detector locations are determined for various levels of practical decontamination procedures. Dose reductions for specified activity patterns within the activity area are also shown. In addition, cost data are presented for a number of the studies corresponding to the effectiveness achieved.

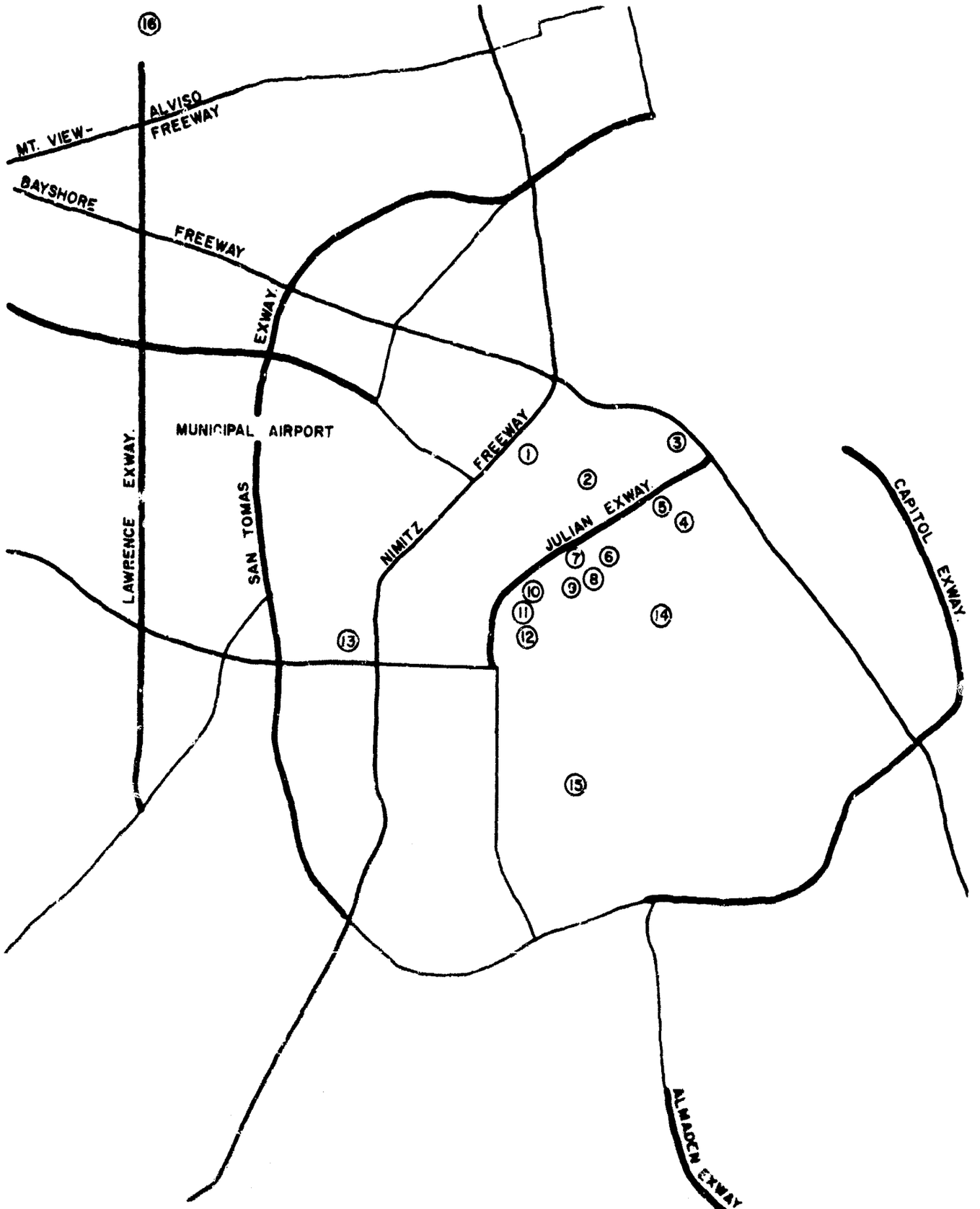


Figure 1

Location of Selected Sites ar Facilities in San Jose, California

Legend for Figure 1

1. San Jose City Hall
2. City Corporation Yard
3. Radio Station KXRX
4. Fire Station No. 8
5. San Jose Hospital
6. Central Business District
7. San Jose Mercury-News
8. Western Greyhound Bus Lines Depot
9. Pacific Telephone and Telegraph Company
10. California Packing Corporation Plant No. 51
11. California Pharmaceutical Laboratory
12. San Jose City Lines
13. Valley Fair Shopping Center
14. Dole Corporation Warehouse
15. A Residential Area
16. Sewage Treatment Plant

II. DECONTAMINATION ANALYSIS OF CALIFORNIA PACKING CORPORATION PLANT NO. 51

A. Discussion

California Packing Corporation Plant No. 51 is a Delmonte plant engaged in the preparation and packaging of fruit. It is located away from the central business district and very near the Southern Pacific Company Passenger Depot.

Figure 2 is a simplified diagram of the plant, showing the locations of detectors and indicating the locations, sizes, and surface materials of some of the contributing planes of contamination to the activity area. The diagram also indicates the portion of the building that is one story and the portion that is two stories. Figures 3 through 8 are a number of photographs taken around the plant area, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 9 is a map indicating the locations and directions of the photographs.

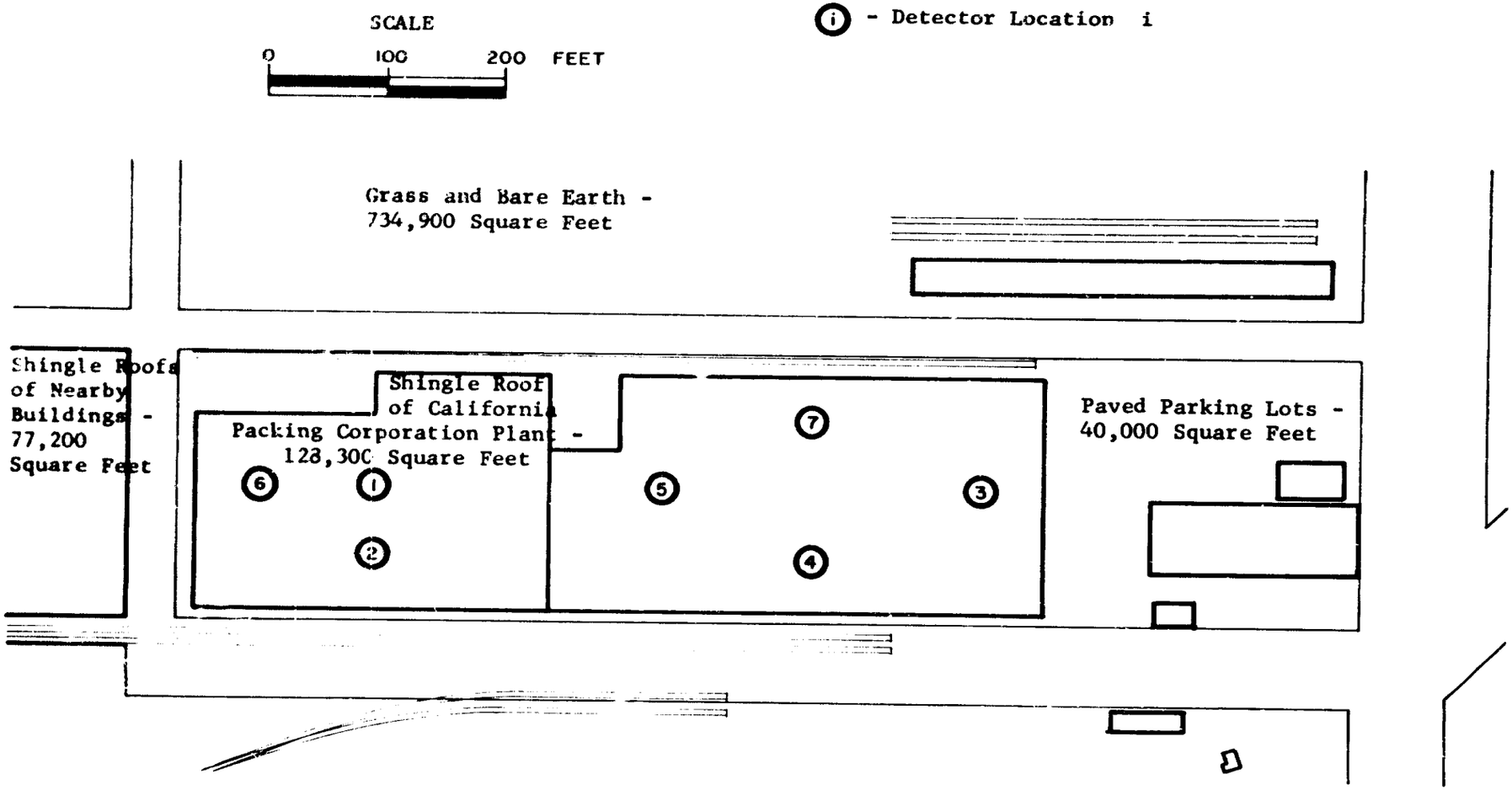


Figure 2

A Map of the Area Around California Packing Corporation Plant No. 51 Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

Figure 3

View 1 - California Packing Corp. Plant No. 51 -
A View of the Building Showing the Parking
Area Adjacent to the Building

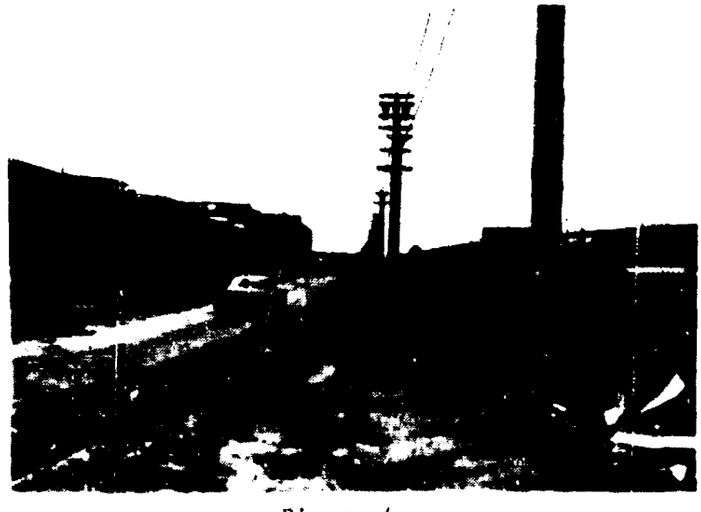


Figure 4

View 2 - California Packing Corp. Plant No. 51 -
A View of the Building Showing the
Adjacent Railroad Tracks

Figure 5

View 3 - California Packing Corp. Plant No. 51 -
A View Showing the Length of the Building

Figure 6

View 4 - California Packing Corp. Plant No. 51 -
A View Showing the Parking Area and a Rail
Siding at the Loading Platform of the Building

Figure 7

View 5 - California Packing Corp. Plant No. 51 -
A View Showing the Rear of Building

Figure 8

View 6 - California Packing Corp. Plant No. 51 -
A Close-up View Showing the Rear of Building
and the Surrounding Ground

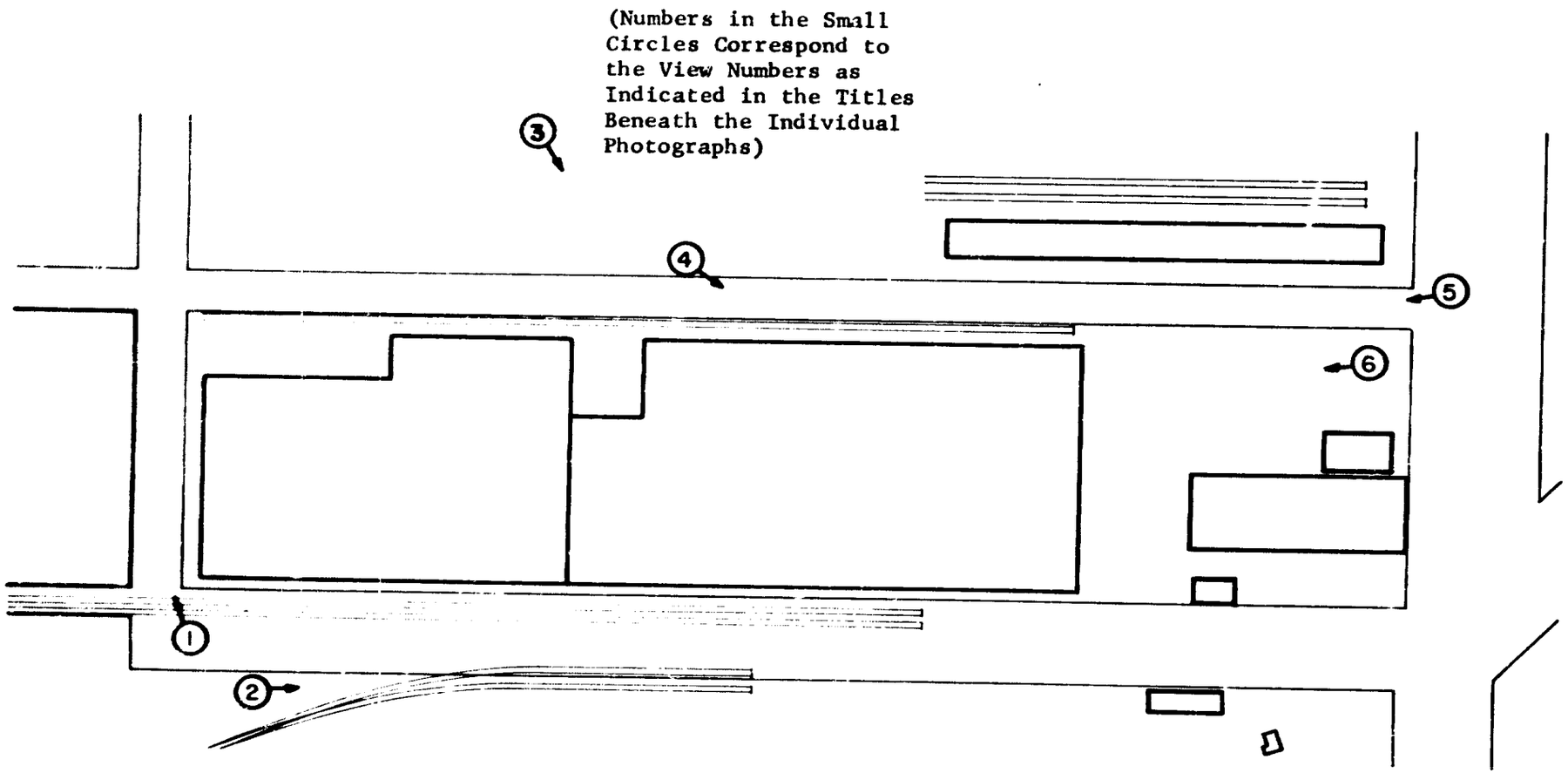


Figure 9

A Map of the Area Around California Packing Corporation Plant No. 51 Showing the Locations and Directions of the Photographs Shown in Figures 3 through 8

B. Definition of Activities

Five different activity patterns are considered in this analysis. Eight detector locations are used to characterize these activity patterns. These detector locations are as follows:

Detector Location	Description
1	Dried Fruit Grading Area (1st Story)
2	Dried Fruit Packing Area (1st Story)
3	Fruit Bins (1st Story)
4	Fruit Drying Area (2nd Story)
5	Store Room (2nd Story)
6	Work Shop (1st Story)
7	Shipping Department (1st Story)
8	Shelter Area

The activities are described entirely according to the amount of time that an activity pattern requires a person to sperd at each of the detector locations. Thus, Table I defines the five activity patterns.

Table I

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN CALIFORNIA PACKING CORP. PLANT NO. 51

	Detector Location j							
Activity Pattern A_i	1 Dried Fruit Grading Area	2 Dried Fruit Packing Area	3 Fruit Bins	4 Fruit Drying Area	5 Store Room	6 Work Shop	7 Shipping Department	8 Shelter Area
A_1	20	.15	.00	.00	.00	.00	.00	.65
A_2	.00	.35	.00	.00	.00	.00	.00	.65
A_3	.00	.00	.05	.35	.00	.00	.00	.60
A_4	.00	.00	.00	.00	.10	.00	.23	.67
A_5	.00	.00	.00	.00	.00	.20	.13	.67

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 2)

Detector Location		Original PF
1	Dried Fruit Grading Area	3.2
2	Dried Fruit Packing Area	3.0
3	Fruit Bin	5.7
4	Fruit Drying Area	5.5
5	Store Room	5.7
6	Work Shop	3.1
7	Shipping Department	5.3
8	Shelter Area	50

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table I)	Equivalent PF
A_1	8.0
A_2	7.8
A_3	12
A_4	13
A_5	9.8

D. Contaminated Planes

Identification Number	Description	Area Size (in ft.^{2})	Surface Material
1A	Roof of Col. Packing Corp. Plant	128,300	Mostly Shingles
1B	Other Roofs	77,200	Mostly Shingles
2	Paved Parking	40,000	Asphalt
3	Streets	234,600	Asphalt
4	Lawns, Bare Earth, Fields, etc.	734,900	Grass & Ground

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contribution to intensity values:

1. Two Story Section

   a. Exterior Walls

      (1) Walls facing Bush and White Streets - brick and cinder block (77 lb/ft^2).

      (2) Wall facing Alameda - brick and cinder block (122 lb/ft^2).

      (3) Wall facing San Fernando Street - 12" brick (96 lb/ft^2).

   b. Floor - 12" reinforced concrete (150 lb/ft^2).

   c. Roof - wood truss and asphalt shingles (10 lb/ft^2).

   d. Interior walls

      (1) Wall parallel to San Fernando Street - 12" brick (108 lb/ft^2).

      (2) Wall parallel to Bush Street - 8" brick (72 lb/ft^2).

2. One Story Section

   a. Exterior Walls

      (1) Wall facing San Fernando Street - brick and cinder block (81 lb/ft^2).

      (2) Wall facing Bush Street - brick and cinder block (94 lb/ft^2).

      (3) Wall facing White Street - 8" brick (72 lb/ft^2).

      (4) Wall adjacent to two story section - included in two story section therefore (0 lb/ft^2).

   b. Roof - wood truss and asphalt singles (10 lb/ft^2).

Table II lists the contribution to intensity factors of the various planes to the selected detector locations.

Table II

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES)
FOR CALIFORNIA PACKING CORP. PLANT NO. 51

Contaminated Plane i	Detector Location j							
	1 Dried Fruit Grading Area	2 Dried Fruit Packing Area	3 Fruit Bins	4 Fruit Drying Area	5 Store Room	6 Work Shop	7 Shipping Department	8 Shelter Area
1A Roof of Calif. Packing Corp.	.2934	.2934	.1685	.1685	.1685	.2934	.1685	.0200
1B Other Roofs	.0000	.0000	.0000	.0004	.0025	.0001	.0000	.0000
2 Paved Parking	.0000	.0000	.0057	.0010	.0005	.0000	.0012	.0000
3 Streets	.0167	.0298	.0008	.0067	.0032	.0251	.0174	.0000
4 Grass & Ground	.0033	.0060	.0005	.0062	.0023	.0026	.0024	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions at detector location j from contaminated plane i are given in Table III below.

Table III

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
FOR CALIFORNIA PACKING CORP. PLANT NO. 51

Contaminated Plane i	Detector Location j							
	1 Dried Fruit Grading Area	2 Dried Fruit Packing Area	3 Fruit Bins	4 Fruit Drying Area	5 Store Room	6 Work Shop	7 Shipping Department	8 Shelter Area
1A Roof of Calif. Packing Corp.	.94	.89	.96	.92	.95	.91	.89	1.00
1B Other Roofs	.00	.00	.00	.00	.01	.00	.00	.00
2 Paved Parking	.00	.00	.03	.01	.00	.00	.01	.00
3 Streets	.05	.09	.00	.04	.02	.08	.09	.00
4 Grass & Ground	.01	.02	.00	.03	.01	.01	.01	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table IV

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR CALIFORNIA PACKING CORP. PLANT NO. 51

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof of Building (1A)	.05	4.3	6
Firehosing	B	Other Roofs (1B)	.05	2.6	6
Firehosing	C	Parking Lots (2)	.03	0.4	5
Firehosing	D	Streets (3)	.03	2.7	5
Street Sweeper	E	Parking Lots (2)	.06	0.8	1
Street Sweeper	F	Streets (3)	.06	4.7	1
Grading	G	Ground (4)	.10	176.4	1

II. RN_j Values

The fraction of intensity remaining for selected strategies of decontamination is given in Table V below.

Table V

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR CALIFORNIA PACKING CORP. PLANT NO. 51

Combined Strategy	Detector Location j							
	1 Dried Fruit Grading Area	2 Dried Fruit Packing Area	3 Fruit Bins	4 Fruit Drying Area	5 Store Room	6 Work Shop	7 Shipping Department	8 Shelter Area
A	.11	.15	.09	.12	.10	.13	.16	.05
C	1.00	1.00	.97	.99	1.00	1.00	.99	1.00
D	.95	.91	1.00	.96	.98	.92	.91	1.00
E	1.00	1.00	.97	.99	1.00	1.00	.99	1.00
F	.95	.91	1.00	.97	.98	.93	.91	1.00
G	.99	.98	1.00	.97	.99	.99	.99	1.00
A+B	.11	.15	.09	.12	.08	.13	.16	.05
A+B+C+D	.06	.07	.05	.08	.06	.06	.06	.05
A+B+E+F	.06	.07	.05	.08	.06	.06	.06	.05
A+B+C+D+G	.05	.05	.05	.05	.05	.05	.05	.05

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table VI.

Table VI

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR CALIFORNIA PACKING CORP. PLANT NO. 51

Combined Strategy	A_1	A_2	A_3	A_4	A_5
A	.12	.14	.11	.12	13
C	1.00	1.00	.99	1.00	1.00
D	.94	.92	.97	.94	.93
E	1.00	1.00	.99	1.00	1.00
F	.94	.92	.97	.95	.93
G	.99	.99	.98	.99	.99
A+B	.12	.14	.11	.12	.13
A+B+C+D	.06	.06	.07	.06	.06
A+B+E+F	.06	.07	.07	.06	.06
A+B+C+D+G	.05	.05	.05	.05	.05

J. Conclusions

Effective decontamination of the California Packing Corporation Plant No. 51 can be achieved by simply firehosing (Strategy A) the roof of the building. The roof offers a minimum of 89% of the intensity contribution to any of the detectors. Decontaminating the roof by method A would leave a maximum of 16% of the original radiation at any detector location. This strategy would require a team of six (6) men working 4.25 hours.

Further, none of the selected activity patterns would receive more than 14% of the original radiation after roof decontamination by method A.

III. DECONTAMINATION ANALYSIS OF CALIFORNIA PHARMACEUTICAL LABORATORY

A. Discussion

The California Pharmaceutical Laboratory is a small building located near a commercial area, but surrounded on three sides by residential structures.

Figure 10 is simplified diagram of the laboratory, showing the locations of detectors and indicating the locations, sizes, and surface materials of contributing planes of contamination in the activity area. Figures 11 and 12 are two photographs taken around the area showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 13 is a map indicating the locations and directions of the photographs.

B. Definition of Activities

Two activity patterns are considered in this analysis. Two detector locations are used to characterize these activities. These detector locations are as follows:

Detector Location	Description
1	Laboratory
2	Shelter Area

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend to each detector location. Thus, Table VII defines the two activity patterns.

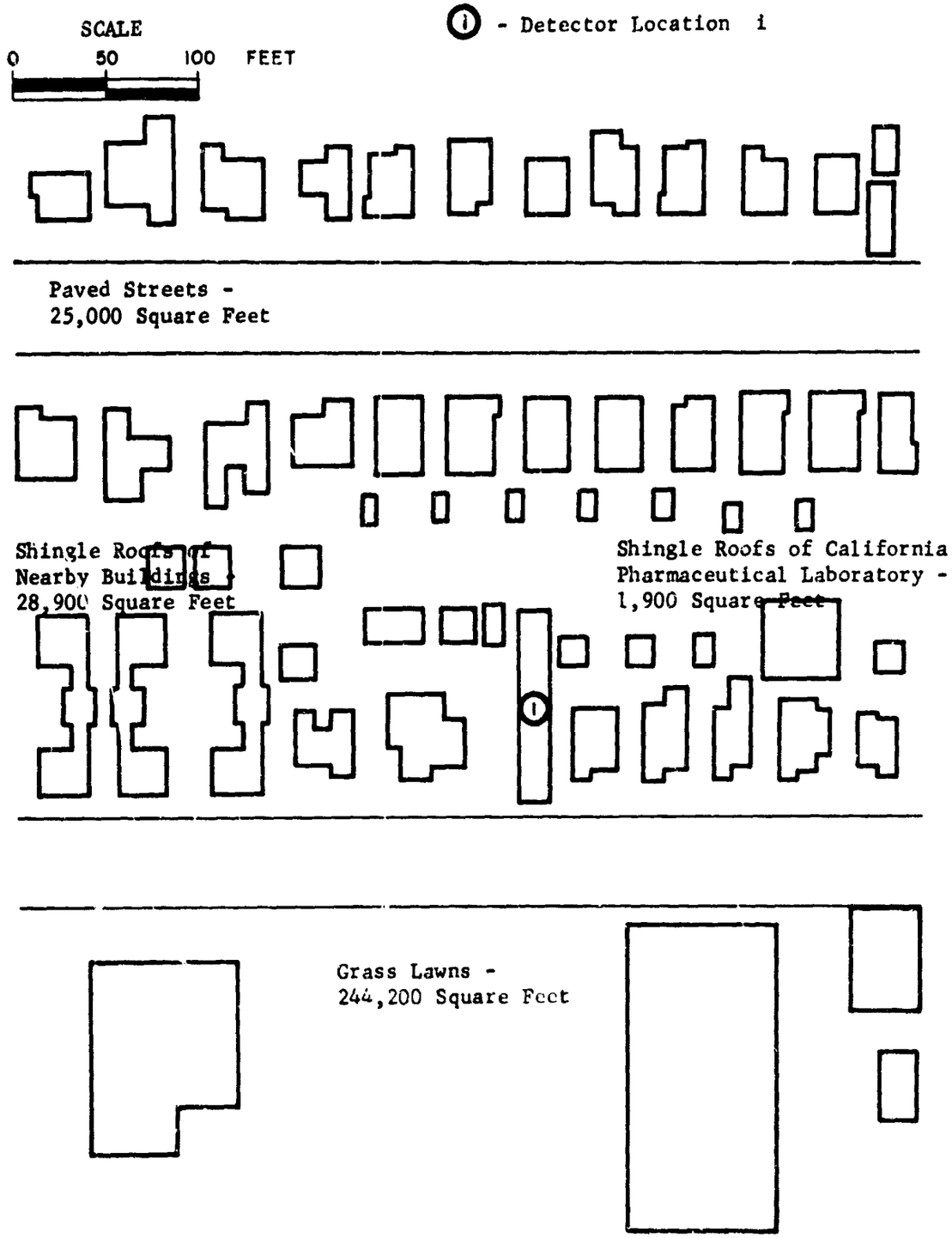


Figure 10

A Map of the Area Around California Pharmaceutical Laboratory Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially ContributingContaminating Planes

Figure 11

View 1 - California Pharmaceutical Laboratory - A View Showing the Front and Side of the Building

Figure 12

View 2 - California Pharmaceutical Laboratory - A View Showing the Laboratory and the Surrounding Area

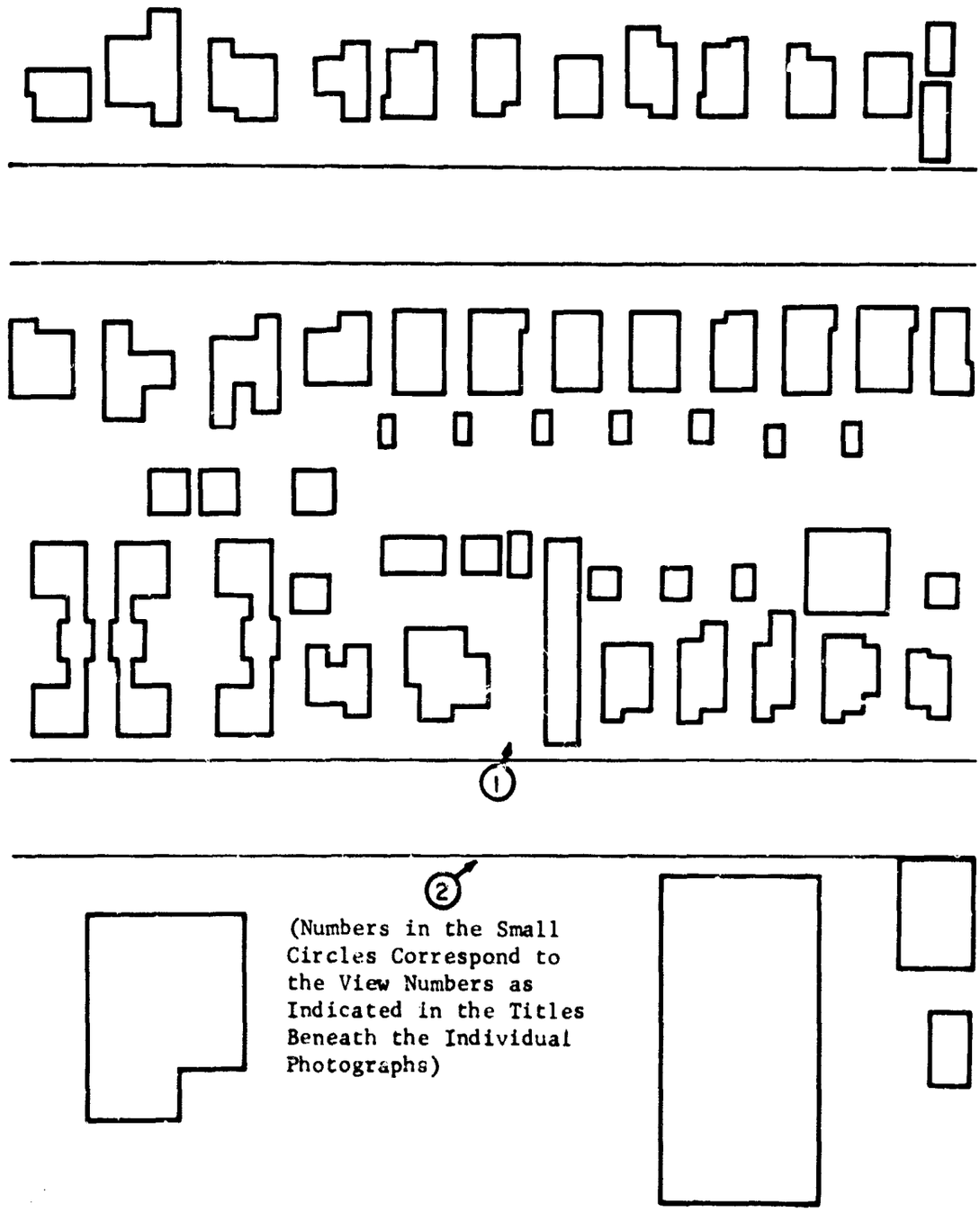


Figure 13

A Map of the Area Around California Pharmaceutical Laboratory Showing the Locations and Directions of the Photographs Shown in Figures 11 and 12

Table VII

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN CALIFORNIA PHARMACEUTICAL LABORATORY

Activity Pattern A_i	Detector Location j	
	1 Laboratory	2 Shelter Area
A_1	.33	.67
A_2	.50	.50

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 10)

Detector Location	Original PF
1 Laboratory	2.2
2 Shelter Area	20

2. Equivalent Protection Factors for the Activity Patterns

Activity Pattern (See Table VII)	Equivalent PF
A_1	5.4
A_2	3.9

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of Lab	1,900	Shingles
1B	Other Roofs	28,900	Shingles
2	Paved Parking	None	--------
3	Streets	25,000	Asphalt
4	Lawns, Bare Earth, Fields, Etc.	244,200	Grass

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the laboratory which were required to calculate the contribution to intensity values:

1. Exterior Walls
   a. Front Wall - ½" glass (7 lb/ft^2)
   b. Side and back wall - 2" wood (5 lb/ft^2)
2. Interior Partitions - 2" wood with openings (4 lb/ft^2)
3. Roof - wooden shingles on rafters (10 lb/ft^2)

Table VIII lists the contribution to intensity factors of the various planes to the selected detector locations.

Table VIII

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES)
FOR CALIFORNIA PHARMACEUTICAL COMPANY

Contaminated Plane i	Detector Location j	
	1 Laboratory	2 Shelter Area
1A Roof of Lab	.1130	.0500
1B Other Roofs	.0000	.0000
2 Paved Parking	.0000	.0000
3 Streets	.0304	.0000
4 Grass & Ground	.3179	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table IX below.

Table IX

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
FOR CALIFORNIA PHARMACEUTICAL LABORATORY

Contaminated Plane i	Detector Location j	
	1 Laboratory	2 Shelter Area
1A Roof of Lab	.24	1.00
1B Other Roofs	.00	.00
2 Paved Parking	.00	.00
3 Streets	.07	.00
4 Grass & Ground	.69	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table X

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR CALIFORNIA PHARMACEUTICAL LABORATORY

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Building Roof (1A)	.05	0.1	6
Firehosing	B	Streets (3)	.03	0.3	5
Vacuumized Sweeper	C	Streets (3)	.09	0.5	1
Grading	D	Ground (4)	.10	58.4	1

H. RN_j Values

The fraction of intensity remaining for selected strategies is given in Table XI.

Table XI

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR CALIFORNIA PHARMACEUTICAL LABORATORY

Combined Strategy	Detector Location j	
	1 Laboratory	2 Shelter Area
A	.77	.05
B	.94	1.00
D	.38	1.00
A+B	.70	.05
A+C+D	.89	.05

I. RN_A Values

The activity reduction factors for selected strategies and the activity patterns are given in Table XII.

Table XII

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND THE ACTIVITY PATTERNS FOR THE CALIFORNIA PHARMACEUTICAL LABORATORY

Combined Strategy	Activity Pattern	
	A_1	A_2
A	.64	.70
B	.95	.94
D	.49	.44
A+B	.59	.64
A+C+D	.08	.08

J. Conclusions

A minimum of 93% of the radiation intensity to the detectors comes from the roof of the laboratory and the surrounding grass and ground. Table XI shows a combined strategy of A (firehosing the roof), C (vacuumized sweeping the streets), and D (grading the grass and ground) reduces the radiation in the laboratory to 9% of its original intensity. This is a time consuming method of decontamination because the grading would require one man to work 58.40 hours. Thus, the vitalness of the facility would determine if decontamination was justified.

Attention is brought to the fact that decontaminating the ground becomes necessary because it accounts for 69% of the radiation intensity in the laboratory.

IV. DECONTAMINATION OF PACIFIC TELEPHONE AND TELEGRAPH COMPANY, SAN JOSE, CALIFORNIA

A. Discussion

This telephone and telegraph company is located in the central business district of San Jose. Under postattack conditions it could serve as a vital means of communication, and, therefore, is an important facility to consider decontaminating.

Figure 14 is a simplified diagram of the facility, showing the locations of detectors and indicating the locations, sizes, and surface materials of the contributing planes of contamination in the activity area. The diagram also indicates the portion of the building that is eight stories and a basement and the portion that is four stories and a basement.

Figures 15 through 20 are a number of photographs taken around the facility, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 21 is a map indicating the locations and directions of the photographs.

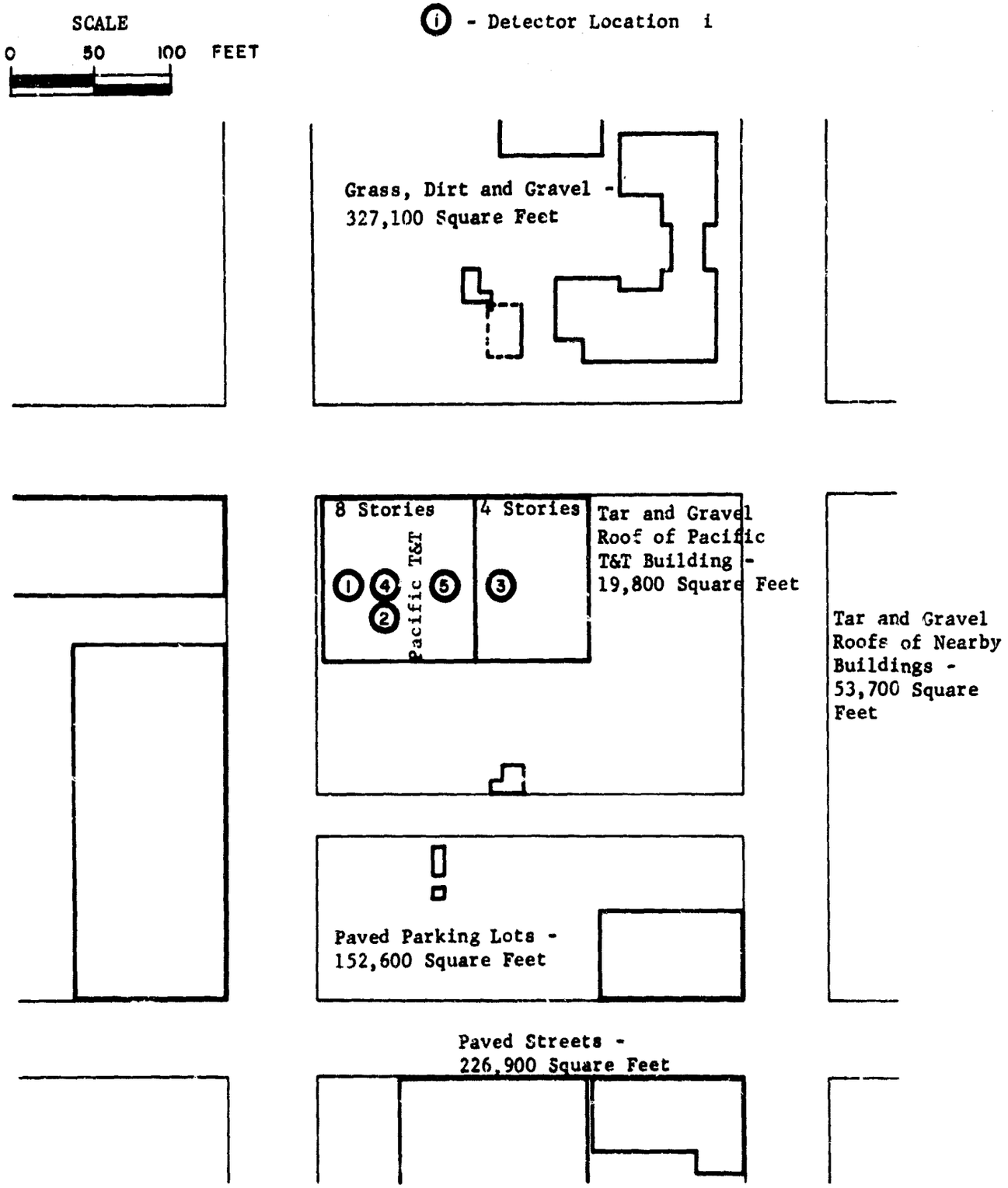


Figure 14

A Map of the Area Around Pacific Telephone and Telegraph Company Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

Figure 15

View 1 - Pacific Telephone and Telegraph Company - A View Showing the Front and One Side of the Building

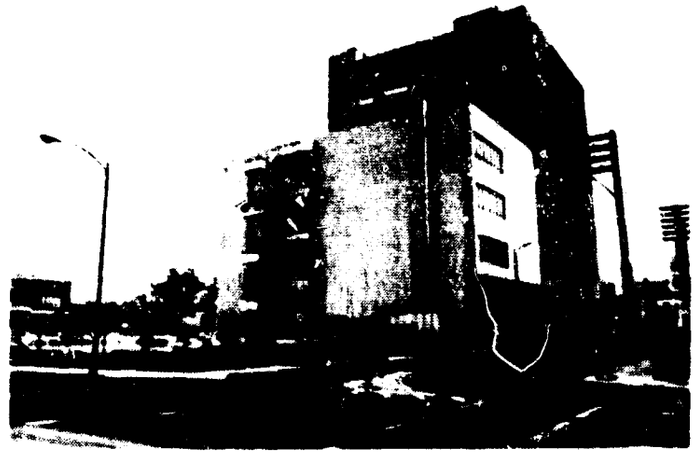


Figure 16

View 2 - Pacific Telephone and Telegraph Company - A View Showing the Back of the Building and the Four Story Section

Figure 17

View 3 - Pacific Telephone and Telegraph Company - A View Showing the Back of the Building and the Surrounding Parking Areas

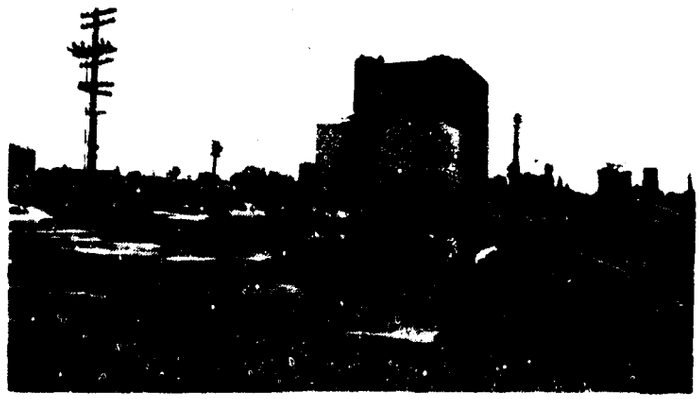


Figure 18

View 4 - Pacific Telephone and Telegraph Company - A View Showing the Vacant Lot on the Street Behind the Building

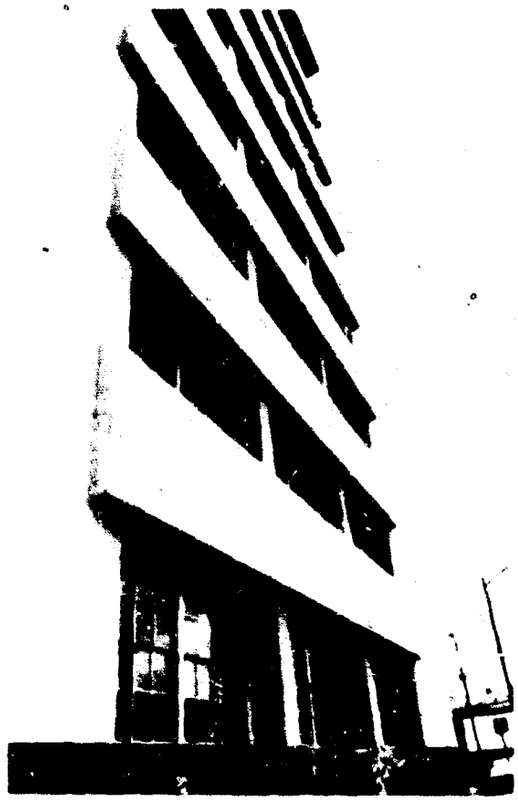


Figure 19

View 5 - Pacific Telephone and Telegraph Company - A View Showing the Proportion of Windows in the Eight Story Section of the Building

Figure 20

View 6 - Pacific Telephone and Telegraph Company - A Closeup View of the Windows in the Eight Story Section

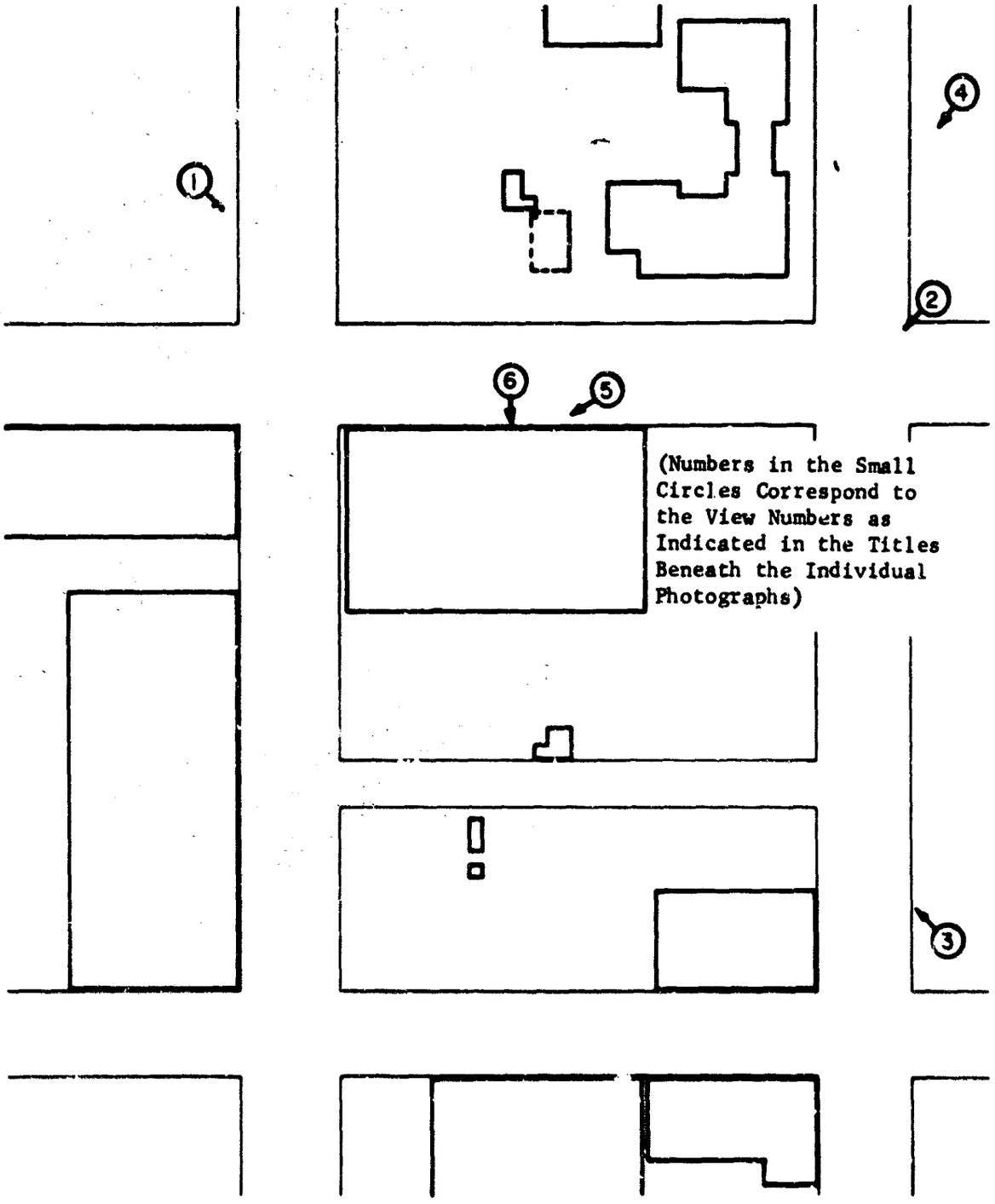


Figure 21

A Map of the Area Around Pacific Telephone and Telegraph Company Showing the Locations and Directions of the Photographs Shown in Figures 15 through 20

B. Definition of Activities

Five different activity patterns are considered in this analysis. Five detector locations are used to characterize these activity patterns. These detector locations are as follows:

Detector Location	Description
1	Long Distance Switchboard (6th Story)
2	Information Switchboard (6th Story)
3	Automatic Exchange Equipment Room (2nd Story)
4	Telegraph Department (3rd Story)
5	Shelter Area (Basement)

The activities are described entirely according to the amount of time an activity pattern requires a person to spend at each of the detector locations. Thus Table XIII defines the five activity patterns.

Table XIII

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN PACIFIC TELEPHONE AND TELEGRAPH COMPANY

Activity Pattern A_i	Detector Location j				
	1 Long Distance Switchboard (6th Story)	2 Information Switchboard (6th Story)	3 Automatic Exchange Equipment Room (2nd Story)	4 Telegraph Department (3rd Story)	5 Shelter Area (Basement)
A_1	.33	.00	.00	.00	.67
A_2	.00	.00	.00	.40	.60
A_3	.15	.20	.00	.00	.65
A_4	.00	.00	.45	.00	.55
A_5	.00	.33	.00	.00	.67

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 14)

Detector Location	Original PF
1 Long Distance Switchboard (6th Story)	23
2 Information Switchboard (6th Story)	23
3 Automatic Exchange Equipment Room (2nd Story)	65
4 Telegraph Department (3rd Story)	53
5 Shelter Area (Basement)	5000

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table XIII)	Equivalent PF
A_1	70
A_2	130
A_3	66
A_4	142
A_5	69

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of Pacific T&T	19,800	Tar and Gravel
1B	Other Roofs	53,700	Tar and Gravel
2	Paved Parking	152,600	Asphalt
3	Streets	226,900	Asphalt
4	Lawn, Bare Earth, etc.	327,100	Grass, Dirt, Gravel, and Ground

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contribution to intensity values:

1. Exterior Walls
   a. Walls facing San Fernando and Almaden - 11" reinforced concrete with 1" marble facing (150 lb/ft^2)
   b. Wall facing Vine - 20" cinder block and 4" brick (210 lb/ft^2)
   c. Wall facing Westminister - 8" reinforced concrete and 1" marble facing (110 lb/ft^2)
2. Floors
   a. Basement and first floor - 8" reinforced concrete (100 lb/ft^2)
   b. Upper floors - 6" reinforced concrete (75 lb/ft^2)
3. Roof - 6" reinforced concrete with tar and gravel surface (75 lb/ft^2)

Table XIV lists the contributions to intensity factors of the various planes to the selected detector locations.

Table XIV

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES) FOR PACIFIC TELEPHONE AND TELEGRAPH COMPANY

Contaminated Plane i	Detector Location j				
	1 Long Distance Switchboard (6th Story)	2 Information Switchboard (6th Story)	3 Automatic Exchange Equipment Room (2nd Story)	4 Telegraph Department (3rd Story)	5 Shelter Area (Basement)
1A Roof of PT&T	.0401	.0401	.0110	.0136	.0000
1B Other Roofs	.0004	.0005	.0002	.0007	.0000
2 Paved Parking	.0010	.0014	.0018	.0016	.0001
3 Streets	.0007	.0010	.0018	.0024	.0001
4 Grass and Ground	.0006	.0005	.0006	.0006	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions at detector location j from contaminated plane i are given in Table XV below.

Table XV

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
TO PACIFIC TELEPHONE AND TELEGRAPH COMPANY

Contaminated Plane i	Detector Location j				
	1 Long Distance Switchboard (6th Story)	2 Information Switchboard (6th Story)	3 Automatic Exchange Equipment Room (2nd Story)	4 Telegraph Department (3rd Story)	5 Shelter Area (Basement)
1A Roof of PT&T	.94	.92	.71	.72	.00
1B Other Roofs	.01	.01	.01	.04	.00
2 Paved Parking	.02	.03	.12	.08	.50
3 Streets	.02	.02	.12	.13	.50
4 Grass and Ground	.01	.01	.04	.03	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table XVI

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR PACIFIC TELEPHONE AND TELEGRAPH COMPANY

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof of PT&T (1A)	.12	0.6	7
Firehosing	B	Roof of PT&T (1A)	.03	1.5	7
Vacuumized Sweeper	C	Parking Lots (2)	.09	3.1	1
Vacuumized Sweeper	D	Streets (3)	.09	4.5	1
Grading	E	Ground (4)	.10	78.5	1

H. RN_j Values

The fraction of intensity remaining for selected strategies is given in Table XVII below.

Table XVII

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR PACIFIC TELEPHONE AND TELEGRAPH COMPANY

Combined Strategy	Detector Location j				
	1 Long Distance Switchboard (6th Story)	2 Information Switchboard (6th Story)	3 Automatic Exchange Equipment Room (2nd Story)	4 Telegraph Department (3rd Story)	5 Shelter Area (Basement)
A	.18	.19	.37	.37	1.00
B	.09	.11	.31	.30	1.00
C+D	.96	.95	.79	.81	.09
E	.99	.99	.96	.97	1.00
B+C+D+E	.04	.05	.06	.08	.09

I. RN_A Values

The acitvity reduction factors for selected strategies and all activity patterns are given in Table XVIII.

Table XVIII

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR PACIFIC TELEPHONE AND TELEGRAPH COMPANY

Combined Strategy	Activity Pattern				
	A_1	A_2	A_3	A_4	A_5
A	.18	.38	.19	.38	.20
B	.10	.31	.11	.32	.11
C+D	.96	.80	.95	.78	.94
E	.99	.97	.99	.97	.99
B+C+D+E	.04	.08	.04	.06	.05

J. Conclusions

As shown in Table XVII, the combined strategy of B (firehosing roof of P.T. & T., C (vacuumized sweeping parking lots), D (vacuumized sweeping streets), and E (grading the ground) reduces the radiation intensity at any detector location to a maximum of 9% of the original radiation. A combined strategy of B, C, and D would actually produce adequate decontamination, because (as shown in Table XVII) strategy E only reduces the initial radiation at any detector location by a maximum of 3%. Strategy E appears to be a poor strategy because it would require one man 78.5 hours to grade the surrounding ground.

It is seen from Table XVIII that a combined strategy of B, C, and D would reduce the radiation for any activity pattern to an acceptable level.

Attention is brought to the fact, as shown in Table XVII, that firehosing the roof of the building at a mass reduction level of .03 (strategy B) rather than at a level of .12 (strategy A) reduces the remaining radiation at the first four detector locations by from 6% to 9% more, yet only requires a team of seven men to work .85 hours longer.

V. DECONTAMINATION OF DOLE CORPORATION WAREHOUSE

A. Discussion

Dole Corporation Warehouse is a building used to store precanned and prepared food for shipment. In a postattack situation this warehouse would very probably be an excellent source for food, and its decontamination would be highly desirable. The warehouse is located in an area which also contains other Dole buildings, including a cannery.

Figure 22 is a simplified diagram of the plant, showing the locations of detectors and indicating the locations, sizes, and surface materials of the contributing planes of contamination to the activity area. Figures 23 through 28 are a number of photographs taken around the plant area showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 29 is a map showing the locations and directions of the photographs.

B. Definition of Activities

Two different activity patterns are considered in this analysis. Five detector locations are used to characterize these activity patterns These detector locations are as follows:

Detector Location	Description
1	Loading Dock
2	Area A in Warehouse
3	Area B in Warehouse
4	Area C in Warehouse
5	Shelter Area

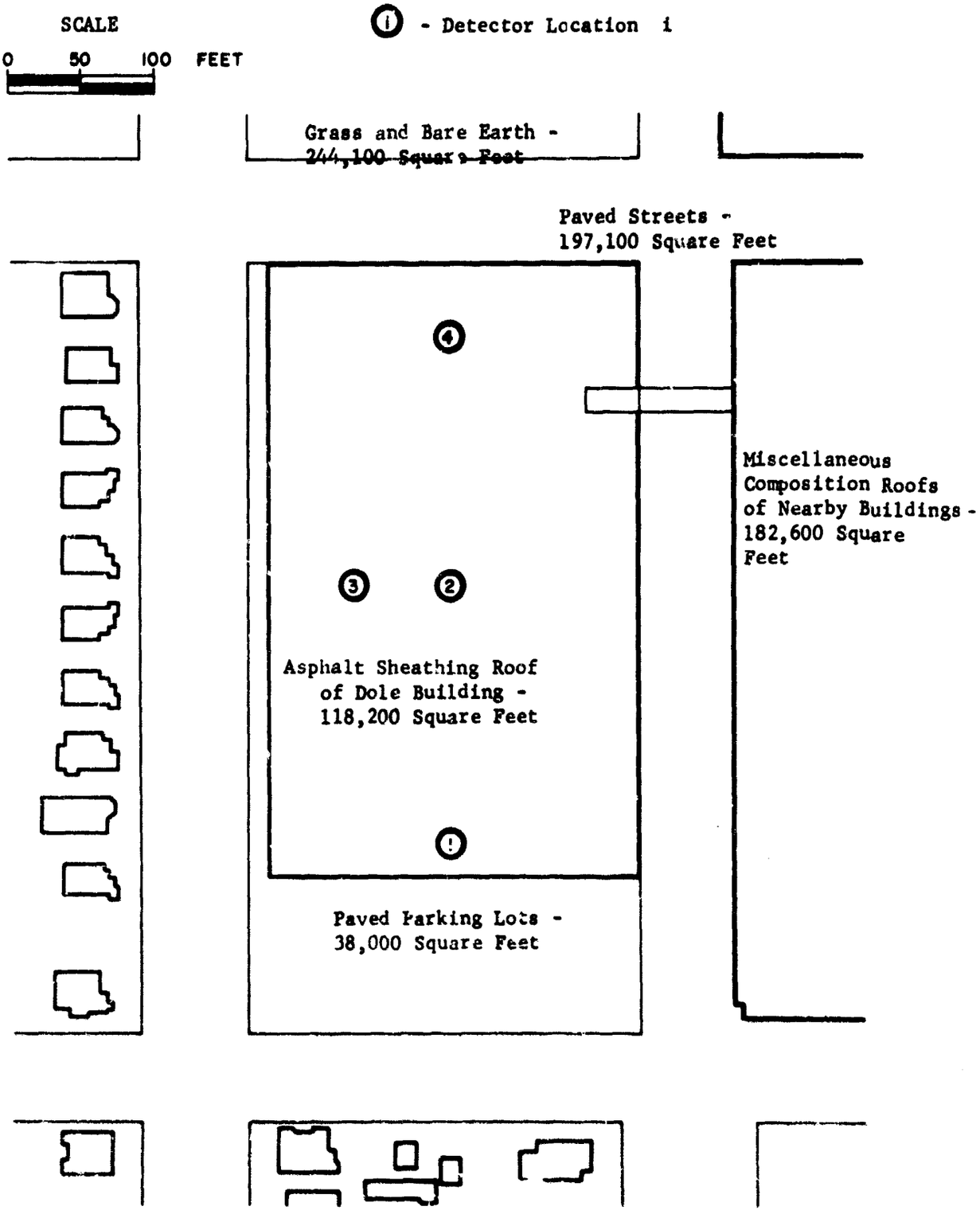


Figure 22

A Map of the Area Around Dole Corporation Warehouse Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

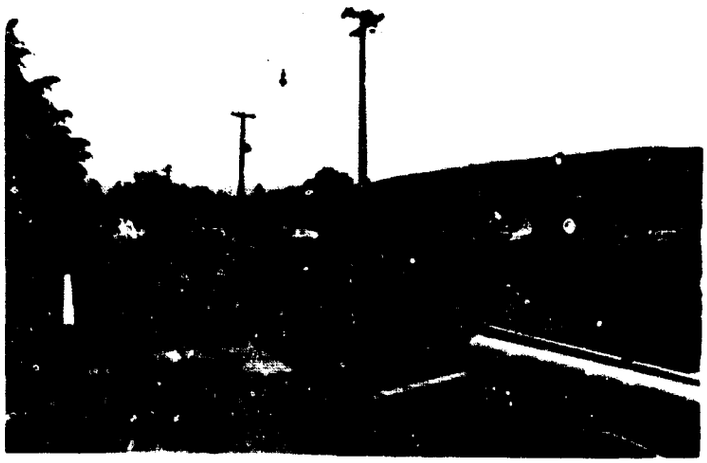


Figure 23

View 1 - Dole Corporation Warehouse -
A View Showing the Parking Area
and the Storage Area at the Rear
of the Building

Figure 24

View 2 - Dole Corporation Warehouse -
A Close-up View Showing the Rear
Area of the Building

Figure 25

View 3 - Dole Corporation Warehouse -
A View Showing the Rail Siding
Along the Warehouse

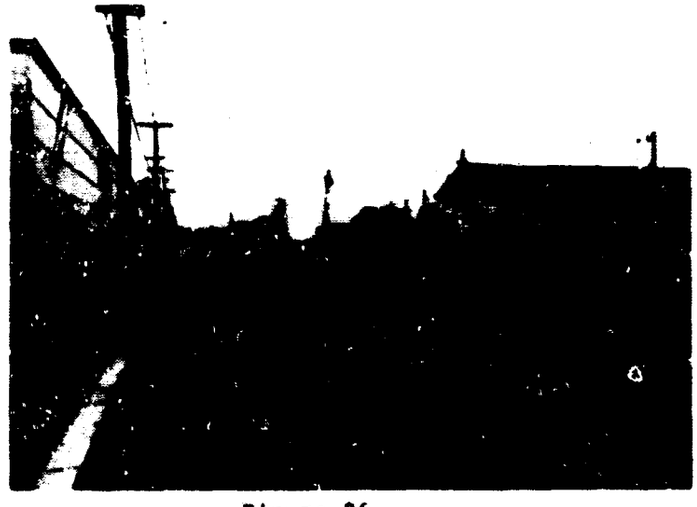


Figure 26

View 4 - Dole Corporation Warehouse -
A View Showing the Side of the
Warehouse and the Dole Box Storage
Yard Across the Street

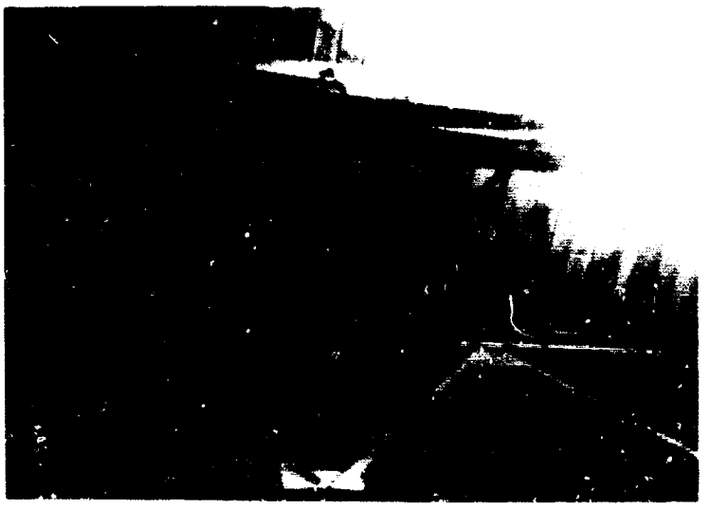


Figure 27

View 5 - Dole Corporation Warehouse - A View Showing the Interior of the Warehouse Roof

Figure 28

View 6 - Dole Corporation Warehouse - A View Showing Prepared Foods Stocked in the Warehouse

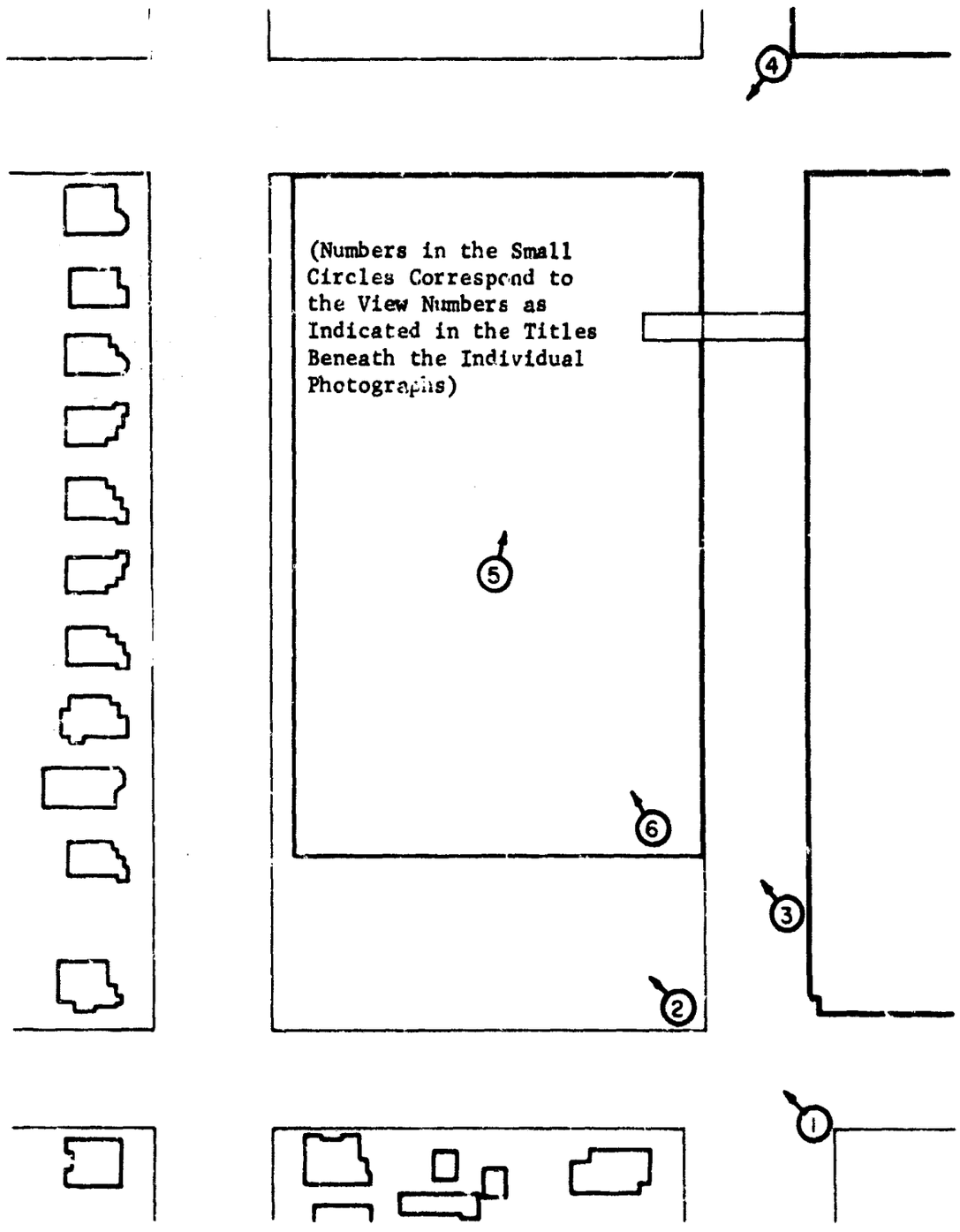


Figure 29

A Map of the Area Around Dole Corporation Warehouse Showing the Locations and Directions of the Photographs Shown in Figures 23 through 28

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table XIX defines the two activities.

Table XIX

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN DOLE CORPORATION WAREHOUSE

Activity Pattern A_i	Detector Location j				
	1 Loading Dock	2 Area A in Warehouse	3 Area B in Warehouse	4 Area C in Warehouse	5 Shelter Area
A_1	.20	.05	.08	.00	.67
A_2	.05	.00	.00	.28	.67

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 22)

Detector Location	Original PF
1 Loading Dock	3.3
2 Area A in Warehouse	3.1
3 Area B in Warehouse	3.4
4 Area C in Warehouse	3.1
5 Shelter Area	20

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table XIX)	Equivalent PF
A_1	7.4
A_2	7.2

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of Dole Bldg.	118,200	Asphalt Sheathing*
1B	Other Roofs	182,600	Miscellaneous*
2	Paved Parking	38,000	Asphalt
3	Streets	197,100	Asphalt
4	Lawns, Bare Earth, Fields, Etc.	244,100	Mainly Dirt

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contribution to intensity values:

1. Exterior walls - 8" reinforced concrete (100 lb/ft^2)
2. Roof - Wooden planks and asphalt sheathing (10 lb/ft^2)

---

* Considered as tar and gravel for decontamination purposes.

Table XX lists the contribution to intensity factors of the various planes to the selected detector locations.

Table XX

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES)
FOR DOLE CORPORATION WAREHOUSE

Contaminated Plane i	Detector Location j				
	1 Loading Dock	2 Area A in Warehouse	3 Area B in Warehouse	4 Area C in Warehouse	5* Shelter Area
1A Roof of Dole Bldg.	.1517	.2944	.2419	.2897	.0500
1B Other Roofs	.0002	.0010	.0023	.0008	.0000
2 Paved Parking	.1296	.0061	.0163	.0044	.0000
3 Streets	.0226	.0177	.0294	.0199	.0000
4 Grass & Ground	.0025	.0028	.0046	.0044	.0000

* Assumed Values

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table XXI below.

Table XXI

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
FOR DOLE CORPORATION WAREHOUSE

Contaminated Plane i	Detector Location j				
	1 Loading Dock	2 Area A in Warehouse	3 Area B in Warehouse	4 Area C in Warehouse	5 Shelter Area
1A Roof of Dole Bldg.	.49	.91	.82	.91	1.00
1B Other Roofs	.00	.00	.01	.00	.00
2 Paved Parking	.42	.02	.06	.01	.00
3 Streets	.07	.05	.10	.06	.00
4 Grass and Ground	.01	.01	.02	.01	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table XXII

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR DOLE CORPORATION WAREHOUSE

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof of Dole Bldg. (1A)	.03	8.6	7
Street Sweeper	B	Parking Lots (2)	.06	0.8	1
Street Sweeper	C	Streets (3)	.03	3.9	1
Vacuumized Sweeper	D	Parking Lots (2)	.09	0.8	1
Vacuumized Sweeper	E	Streets (3)	.09	3.9	1
Grading	F	Ground (4)	.10	58.8	1

H. RN_j Values

The fraction of intensity remaining for selected strategies is given in Table XXIII below.

Table XXIII

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR DOLE CORPORATION WAREHOUSE

Combined Strategy	Detector Location j				
	1 Loading Dock	2 Area A in Warehouse	3 Area B in Warehouse	4 Area C in Warehouse	5 Shelter Area
A	.52	.11	.20	.12	.03
B	.60	.98	.95	.99	1.00
C	.93	.95	.90	.94	1.00
D	.62	.98	.95	.99	1.00
E	.93	.95	.91	.94	1.00
F	.99	.99	.99	.99	1.00
A+B+C	.05	.04	.05	.04	.03

I. RN_A Values

The activity reduction factors for selected strategies and both activity patterns are given in Table XXIV.

Table XXIV

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR DOLE CORPORATION WAREHOUSE

Combined Strategy	Activity Pattern	
	A_1	A_2
A	.29	.14
B	.81	.95
C	.94	.95
D	.81	.95
E	.95	.96
F	.99	.99
A+B+C	.04	.04

J. Conclusions

With the exception of the loading dock, the roof of the Dole Warehouse is, by far, the plane offering the greatest radiation intensity to the detector locations. However, because of the position of the dock to the paved parking area, the latter provides 42% of the intensity to the loading dock detector.

Combined decontamination strategy, A (firehosing roof of building), B (street sweeping the parking lots), and C (street sweeping the streets) reduces the radiation remaining to a maximum of 5% of its original intensity at any detector location. This combined strategy can be accomplished relatively quickly, with the longest effort required being the decontmination of the roof, 8.55 hours by a team of seven men.

The above strategy would reduce the radiation to 4% of its original intensity for both activity patterns considered.

It should be stated here that the original PF's inside the warehouse could be made much higher simply by stacking the food in an appropriate manner. The interim contents of the warehouse were not used in computing the original PF's.

VI. DECONTAMINATION ANALYSIS OF SAN JOSE MERCURY - NEWS

A. Discussion

The San Jose Mercury - News Company is a newspaper publishing and printing company located in the business district of San Jose. In a postattack environment, it could be of great benefit in keeping the surrounding community in contact with the state of conditions and affairs.

Figure 30 is a simplified diagram of the building, showing the locations of detectors and indicating the locations, sizes, and surface materials of the contributing planes of contamination to the activity area. The diagram also indicates which portion of the building is two stories and which portion is one story. Figures 31 through 40 are a number of photographs taken around the plant area, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 41 is a map showing the locations and directions of the photographs.

B. Definition of Activities

Four different activity patterns are considered in this analysis. Five detector locations are used to characterize these activity patterns. These detector locations are as follows:

Detector Location	Description
1	Truck Loading Dock (1st Story)
2	Press Room (1st Story)
3	Copy Room (1st Story)
4	Type Setting Room (2nd Story)
5	Shelter Area

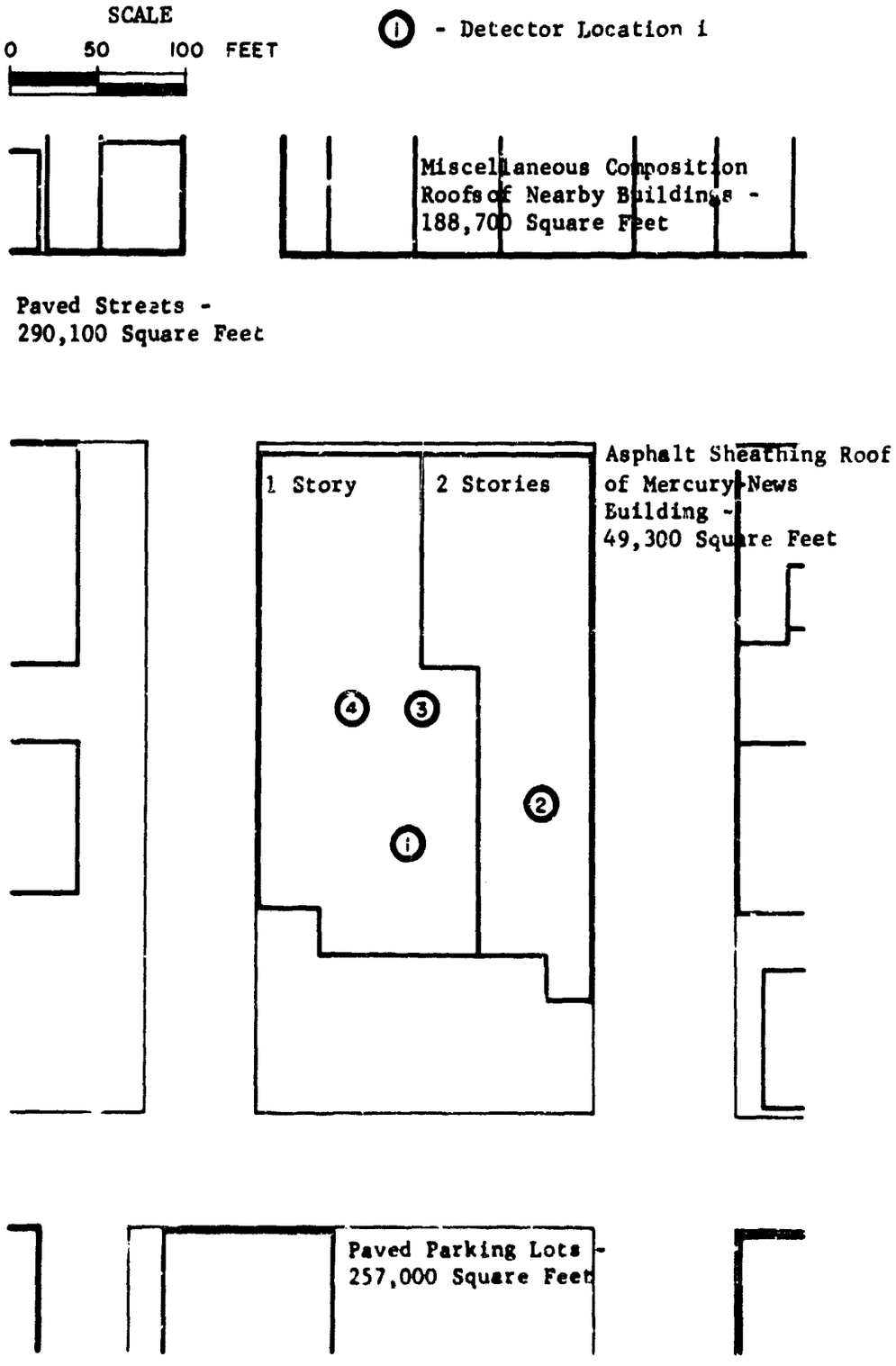


Figure 30

A Map of the Area Around San Jose Mercury-News Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

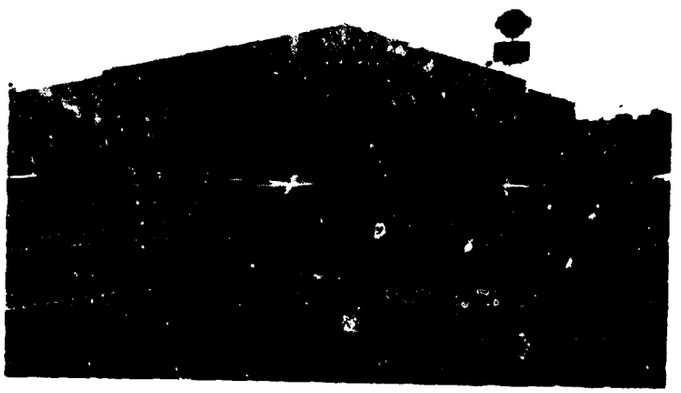


Figure 31

View 1 - San Jose Mercury - News -
An Exterior View of the Front of the
San Jose Mercury - News

Figure 32

View 2 - San Jose Mercury - News -
A View Showing the Loading Dock
at the Rear of the Building

Figure 33

View 3 - San Jose Mercury - News -
A View Showing the Loading Dock and Parking Area at the Rear of the Building

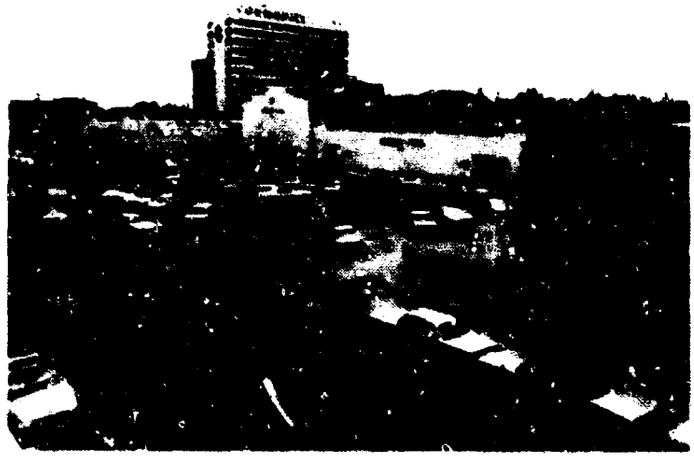


Figure 34

View 4 - San Jose Mercury - News -
A View Showing the Parking Lots and Buildings Across the Street from the Mercury - News

Figure 35

View 5 - San Jose Mercury - News -
A View Showing a Side of the
Mercury - News Building

Figure 36

View 6 - San Jose Mercury - News -
A View Showing the Roof of the
Mercury - News Building

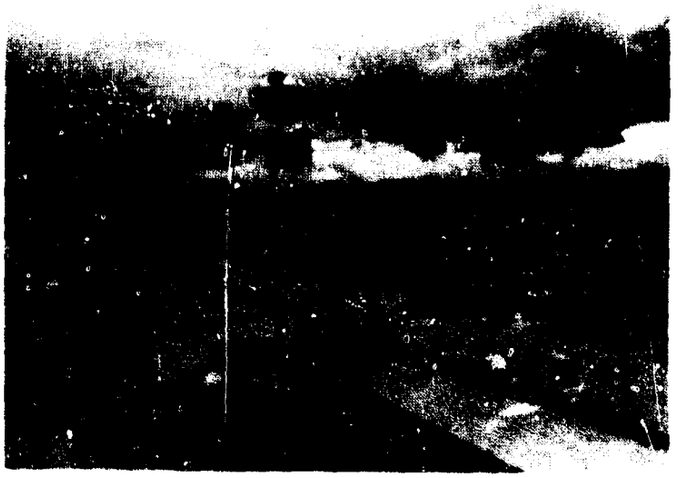


Figure 37

View 7 San Jose Mercury - News -
Another View Showing the Roof of the
Mercury - News Building

Figure 38

View 8 - San Jose Mercury - News -
A View of the Type Setting Room

Figure 39

View 9 - San Jose Mercury - News -
A View of the Copy Room

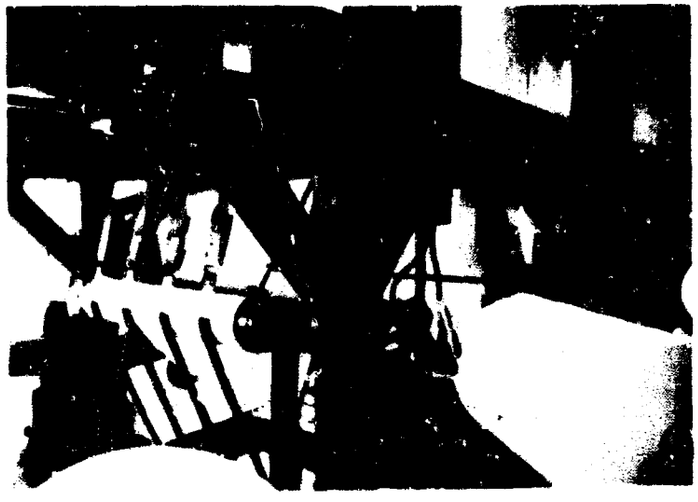


Figure 40

View 10 - San Jose Mercury - News -
A View of the Press Room

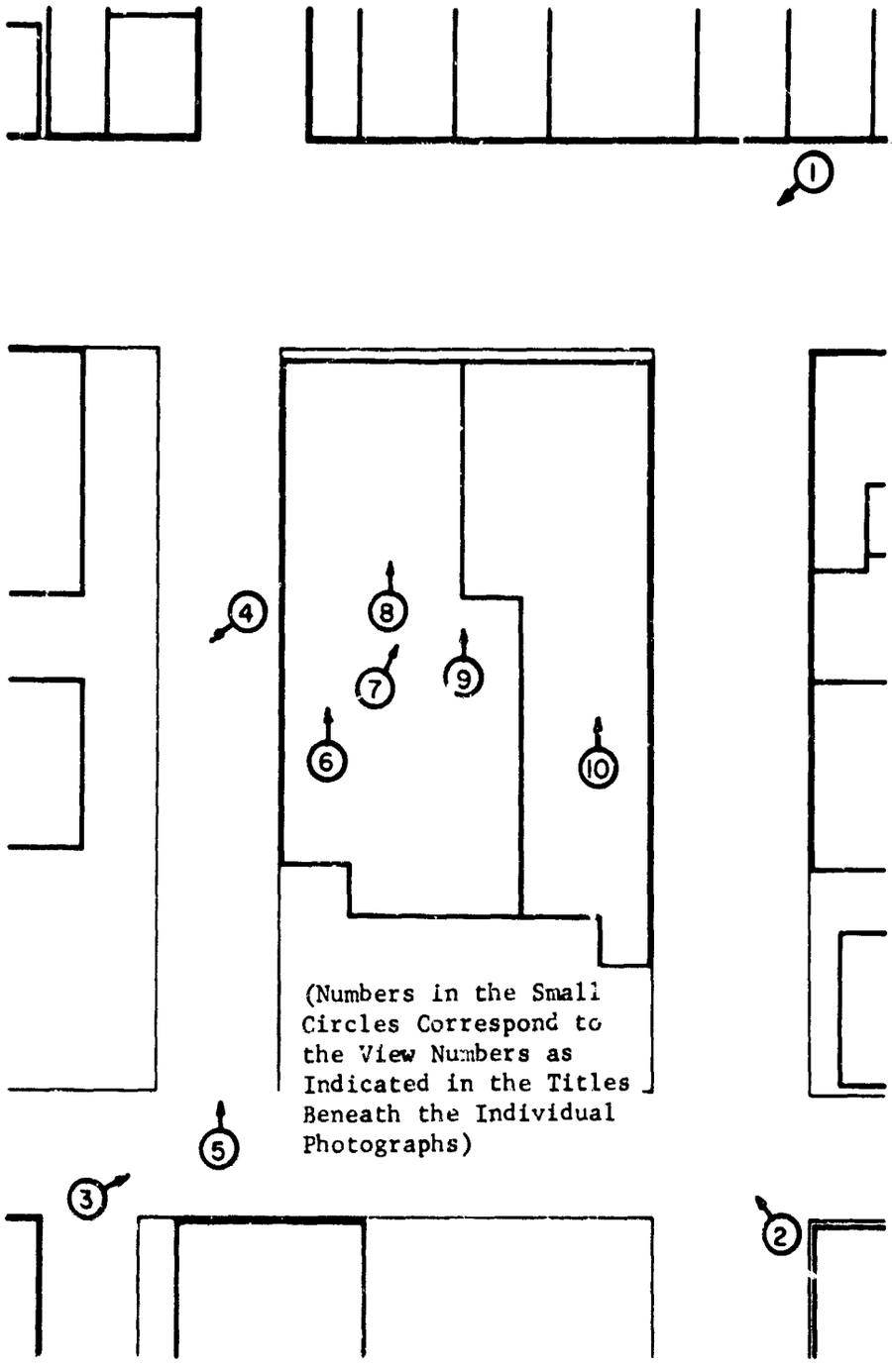


Figure 41

A Map of the Area Around San Jose Mercury-News Showing the Locations and Directions of the Photographs Shown in Figures 31 through 40

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table XXV defines the four activity patterns.

Table XXV

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN SAN JOSE MERCURY - NEWS

Activity A_i	Detector Location j				
	1 Trucking Loading Dock	2 Press Room	3 Copy Room	4 Type Setting Room	5 Shelter Area
A_1	.00	.00	.00	.33	.67
A_2	.00	.20	.00	.13	.67
A_3	.10	.23	.00	.00	.67
A_4	.00	.00	.33	.00	.67

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 30)

Detector Location	Original PF
1 Truck Loading Dock	5.0
2 Press Room	4.0
3 Copy Room	3.3
4 Type Setting Room	5.3
5 Shelter Area	50

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table XXV)	Equivalent PF
A_1	13
A_2	11
A_3	11
A_4	8.7

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of Mercury News	49,300	Asphalt Sheathing*
1B	Other Roofs	188,700	Miscellaneous*
2	Paved Parking	257,000	Asphalt
3	Streets	290,100	Asphalt
4	Lawns, Bare Earth, Fields, Etc.	None	-------

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contribution to intensity values:

1. Exterior walls - 8" cinder block (72 lb/ft^2)
2. Interior walls - 6" cinder block (55 lb/ft^2)
3. Floors - 3" reinforced concrete (37 lb/ft^2)
4. Roof - Asphalt sheathing on timber (10 lb/ft^2)

Table XXVI lists the contribution to intensity factors of the various planes to the selected detector locations.

Table XXVI

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES)
FOR SAN JOSE MERCURY - NEWS

Contaminated Plane i	Detector Location j				
	1 Truck Loading Dock	2 Press Room	3 Copy Room	4 Type Setting Room	5 Shelter Area
1A Roof of Mercury News	.1230	.1230	.3000	.1230	.0200
1B Other Roofs	.0000	.0000	.0012	.0000	.0000
2 Paved Parking	.0504	.0131	.0011	.0269	.0000
3 Streets	.0260	.1137	.0045	.0389	.0000
4 Grass & Ground	.0000	.0000	.0000	.0000	.0000

* Considered tar and gravel for decontamination purposes.

** Assumed Values

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table XXVII below.

Table XXVII

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
FOR SAN JOSE MERCURY - NEWS

Contaminated Plane i	Detector Location j				
	1 Truck Loading Dock	2 Press Room	3 Copy Room	4 Type Setting Room	5 Shelter Area
1A Roof of Mercury News	.62	.49	.98	.65	1.00
1B Other Roofs	.00	.00	.00	.00	.00
2 Paved Parking	.25	.05	.00	.14	.00
3 Streets	.13	.46	.01	.21	.00
4 Grass & Ground	.00	.00	.00	.00	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table XXVIII

COST AND EFFECTIVENESS FOR SELECTED METHODS OF DECONTAMINATING SAN JOSE MERCURY - NEWS

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof of Mercury News (1A)	.03	3.5	7
Firehosing	B	Roof of Mercury News (1A)	.12	1.5	7
Firehosing	C	Other Roofs (1B)	.03	13.9	7
Firehosing	D	Other Roofs (1B)	.12	8.3	7
Street Sweeper	E	Paved Parking(2)	.06	5.2	1
Street Sweeper	F	Streets (3)	.06	5.8	1

H. RN_j Values

The fraction of intensity remaining for selected strategies of decontamination is given is Table XXIX below.

Table XXIX

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR SAN JOSE MERCURY - NEWS

Combined Strategy	Detector Location j				
	1 Truck Loading Dock	2 Press Room	3 Copy Room	4 Type Setting Room	5 Shelter Area
A	.40	.52	.05	.37	.03
B	.46	.57	.14	.43	.12
E	.76	.95	1.00	.87	1.00
F	.88	.57	.99	.81	1.00
A+C	.40	.52	.05	.37	.03
B+D	.46	.57	.14	.43	.12
E+F	.64	.52	.98	.67	1.00
A+C+E+F	.04	.05	.03	.04	.03

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns is given in Table XXX.

Table XXX

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR SAN JOSE MERCURY - NEWS

Combined Strategy	Activity Pattern			
	A_1	A_2	A_3	A_4
A	.31	.40	.42	.05
B	.37	.46	.48	.14
E	.89	.93	.92	1.00
F	.84	.70	.70	.99
A+C	.31	.40	.42	.05
B+D	.37	.46	.48	.13
E+F	.73	.64	.62	.98
A+C+E+F	.04	.04	.04	.03

J. Conclusions

Table XXIX indicates that the combined strategy A (firehosing the roof), C (firehosing other roofs), E (street sweeping parking lots), and F (street sweeping streets) will reduce the radiation remaining at any detector location to a maximum of 5% of its original value. A strategy of B (firehosing the roof), D (firehosing other roofs), E (street sweeping paved parking), and F (street sweeping streets), might also be employed, but the fraction of intensity remaining would be slightly higher because B and D have a mass reduction factor of .12, while A and C have a mass reduction factor of .03.

Attention is brought to comparing strategy A with B and C with D in Table XXVIII

as a way of showing the different amount of effort to decontaminate the same plane by the same means at different levels of mass reduction.

If combined strategy A+C+E+F is employed, no activity pattern will receive more than 4% of the original radiation.

VII. DECONTAMINATION ANALYSIS OF WESTERN GREYHOUND BUS LINES DEPOT

A. Discussion

The Western Greyhound Bus Lines Depot is located in the business district of San Jose.

Figure 42 is simplified diagram of the depot showing the locations of detectors and indicating the locations, sizes, and surface materials of the contributing planes of contamination to the activity area. .Figures 43 through 48 are a number of photographs taken around the depot showing many of the contaminated planes and other features of the area that influence decontamination. Figure 49 is a map showing the locations and directions of these photographs.

B. Definition of Activities

Three different activity patterns are considered in this analysis. Five detector locations are required to characterize the activities. These detector locations are as follows:

Detector Location	Description
1	Ticket Counter
2	Baggage Room
3	Main Lobby
4	Loading Area
5	Shelter Area

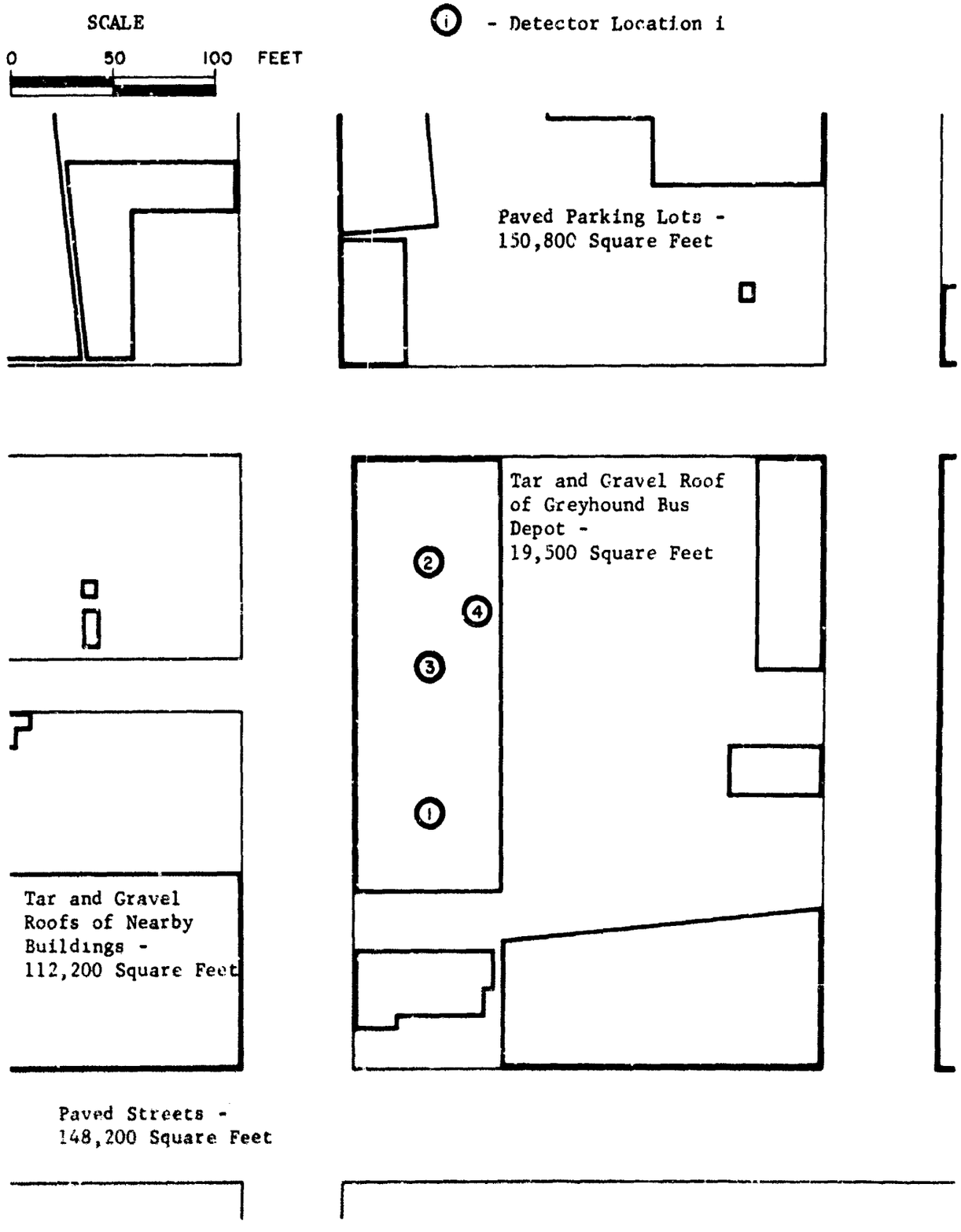


Figure 42

A Map of the Area Around Western Greyhound Bus Depot Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

Figure 43

View 1 - Western Greyhound Bus Depot -
A View Showing the Front of the
Bus Depot

Figure 44

View 2 - Western Greyhound Bus Depot -
A Front View of the Bus Depot
and the Surrounding Area

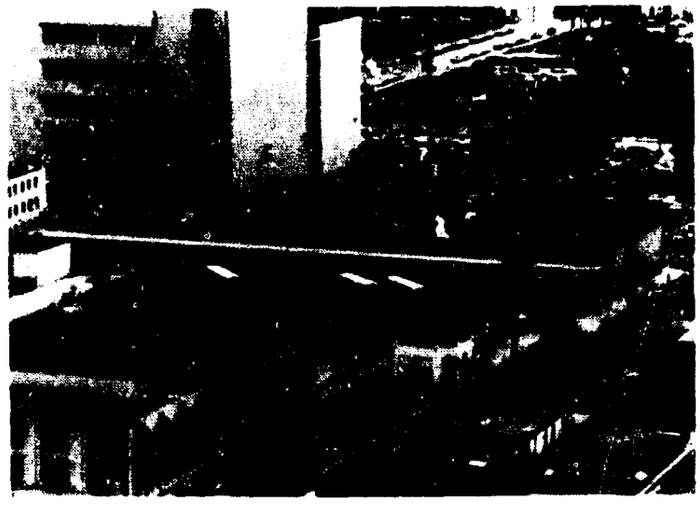


Figure 45

View 3 - Western Greyhound Bus Depot -
An Aerial View of the Back of the
Bus Depot

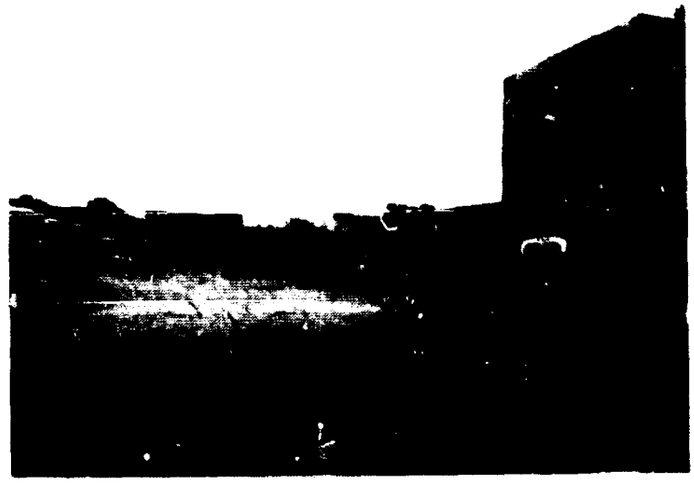


Figure 46

View 4 - Western Greyhound Bus Depot -
A View of the Bus Loading Area

Figure 47

View 5 - Western Greyhound Bus Depot -
A View of the Back of the Bus Depot
from Across the Street

Figure 48

View 6-Western Greyhound Bus Depot -
A View of the Waiting Room

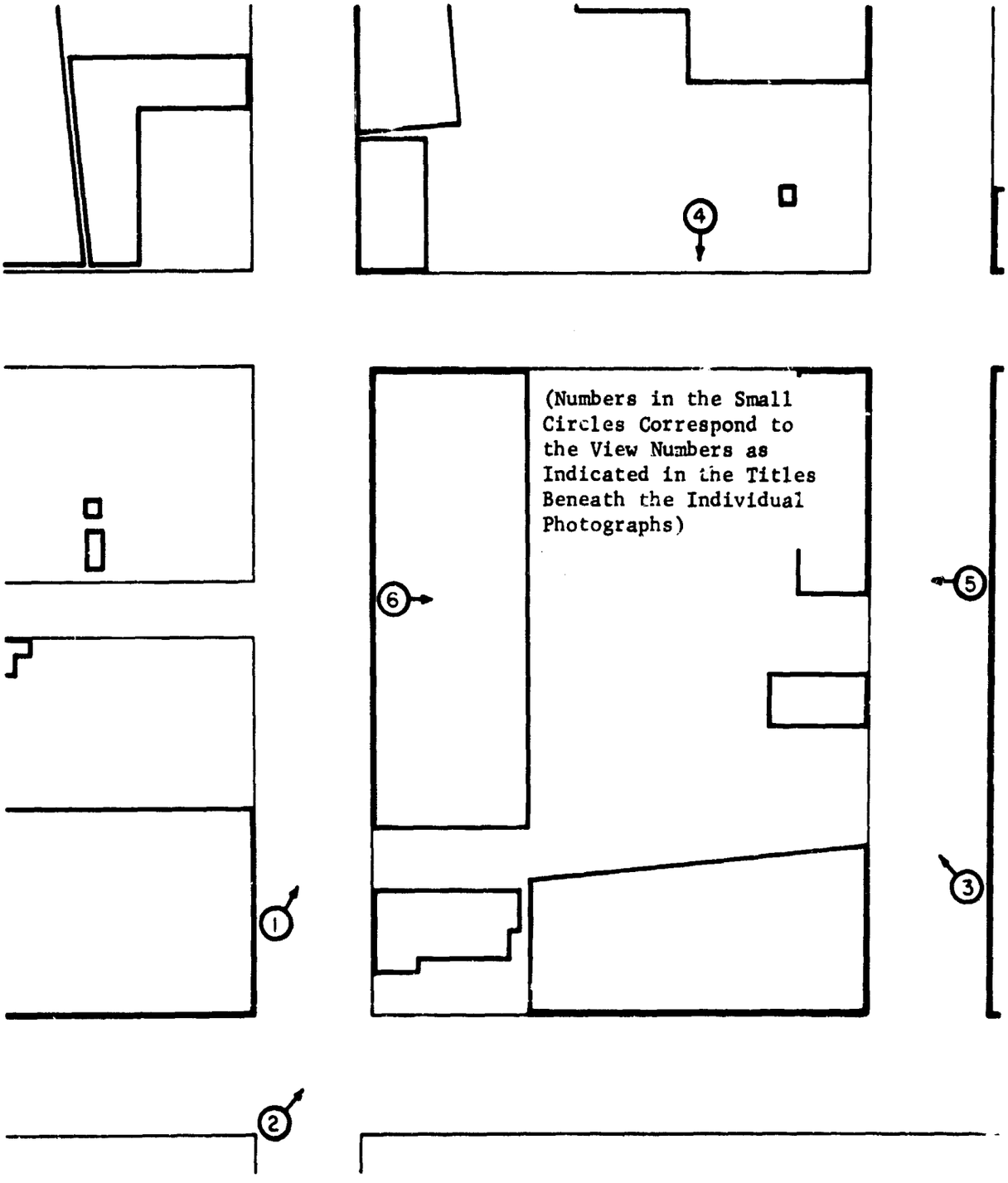


Figure 49

A Map of the Area Around Western Greyhound Bus Depot Showing the Locations and Directions of the Photographs Shown in Figures 43 through 48

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table XXXI defines the three activity patterns.

Table XXXI

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN THE WESTERN GREYHOUND BUS LINES DEPOT

Activity Pattern A_i	Detector Location j				
	1 Ticket Counter	2 Baggage Room	3 Main Lobby	4 Loading Area	5 Shelter Area
A_1	.25	.00	.08	.00	.67
A_2	.00	.17	.00	.16	.67
A_3	.00	.05	.28	.00	.67

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 42)

Detector Location	Original PF
1 Ticket Counter	5.6
2 Baggage Room	5.7
3 Main Lobby	5.6
4 Loading Area	3.2
5 Shelter Area	20

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table XXXI)	Equivalent PF
A_1	11
A_2	8.8
A_3	11

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of Greyhound Depot	19,500	Tar & Gravel
1B	Other Roofs	112,200	Tar & Gravel
2	Paved Parking	150,800	Asphalt
3	Streets	148,200	Asphalt
4	Lawns, Bare Earth, Fields, Etc.	None	-------

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contributions to intensity values:

1. Exterior walls - 8" hollow block (55 lb/ft^2)
2. Interior partitions - 6" cinder block (54 lb/ft^2)
3. Roof - cellular deck with tar & gravel covering (40 lb/ft^2)

Table XXXII lists the contribution to intensity factors of the various planes to the selected detector locations.

Table XXXII

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES)
FOR WESTERN GREYHOUND BUS LINES DEPOT

Contaminated Plane i	Detector Location j				
	1 Ticket Counter	2 Baggage Room	3 Main Lobby	4 Loading Area	5 Shelter Area
1A Roof of Greyhound Depot	.0985	.0976	.0945	.0556	.0500
1B Other Roofs	.0000	.0000	.0000	.0000	.0000
2 Paved Parking	.0398	.0376	.0494	.2427	.0000
3 Streets	.0400	.0407	.0340	.0176	.0000
4 Grass & Ground	.0000	.0000	.0000	.0000	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table XXXIII.

Table XXXIII

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
FOR WESTERN GREYHOUND BUS LINES DEPOT

Contaminated Plane i	Detector Location j				
	1 Ticket Counter	2 Baggage Room	3 Main Lobby	4 Loading Area	5 Shelter Area
1A Roof of Greyhound Depot	.55	.55	.53	.18	1.00
1B Other Roofs	.00	.00	.00	.00	.00
2 Paved Parking	.22	.21	.28	.77	.00
3 Streets	.22	.23	.19	.06	.00
4 Grass & Ground	.00	.00	.00	.00	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table XXXIV

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR WESTERN GREYHOUND BUS LINES DEPOT

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof of Greyhound Depot (1A)	.03	1.4	7
Street Sweeper	B	Paved Parking (2)	.06	3.0	1
Street Sweeper	C	Streets (3)	.06	3.0	1

H. RN_j Values

The fraction of intensity remaining for selected strategies of decontamination are given in Table XXXV below.

Table XXXV

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR WESTERN GREYHOUND BUS LINES DEPOT

Combined Strategy	Detector Location j				
	1 Ticket Counter	2 Baggage Room	3 Main Lobby	4 Loading Area	5 Shelter Area
A	.46	.46	.46	.83	.03
B	.79	.80	.78	.28	1.00
C	.79	.78	.82	.95	1.00
A+B	.25	.26	.22	.11	.03
A+C	.25	.24	.31	.78	.03
A+B+C	.04	.04	.04	.05	.03

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table XXXVI.

Table XXXVI

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR WESTERN GREYHOUND BUS LINES DEPOT

Combined Stategy	Activity Pattern		
	A_1	A_2	A_3
A	.31	.50	.32
B	.86	.63	.84
C	.87	.92	.88
A+B	.17	.12	.16
A+C	.18	.42	.20
A+B+C	.04	.04	.04

J. Conclusions

Table XXXV shows that combined strategy A (firehosing the roof of the bus depot), B (street sweeping the paved parking), and C (street sweeping the streets) will reduce the radiation remaining at any detector location to maximum of 5% of its original value. This decontamination can be accomplished quickly with relatively few people as Table XXXIV indicates. No consideration is given to decontaminating roofs of other buildings, because they contribute no radiation to the detector locations.

Combined strategy A+B+C reduces the radiation for all activity patterns to 4% of the radiation that would have been received originally.

VIII. DECONTAMINATION ANALYSIS OF SAN JOSE CITY LINES

A. Discussion

San Jose City Lines is the bus garage and repairing facility for the local bus line. It is located away from the central business district. In a postattack situation the local bus service might be used to transport people and necessary food, medicine, etc. to various points in the city.

Figure 50 is a simplified diagram of the facility, showing the locations of detectors and indicating the locations, sizes, and surface materials of the contributing planes of contamination to the activity area. Figures 51 through 58 are a number of photographs taken around the building area, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 59 is a map showing the locations and directions of the photographs.

B. Definition of Activities

Four different activity patterns are considered in this analysis. Five detector locations are used to characterize these activity patterns. These detector locations are as follows:

Detector Location	Description
1	Repair Area A
2	Repair Area B
3	Repair Area C
4	Outdoor Gas & Oil Facility
5	Shelter Area

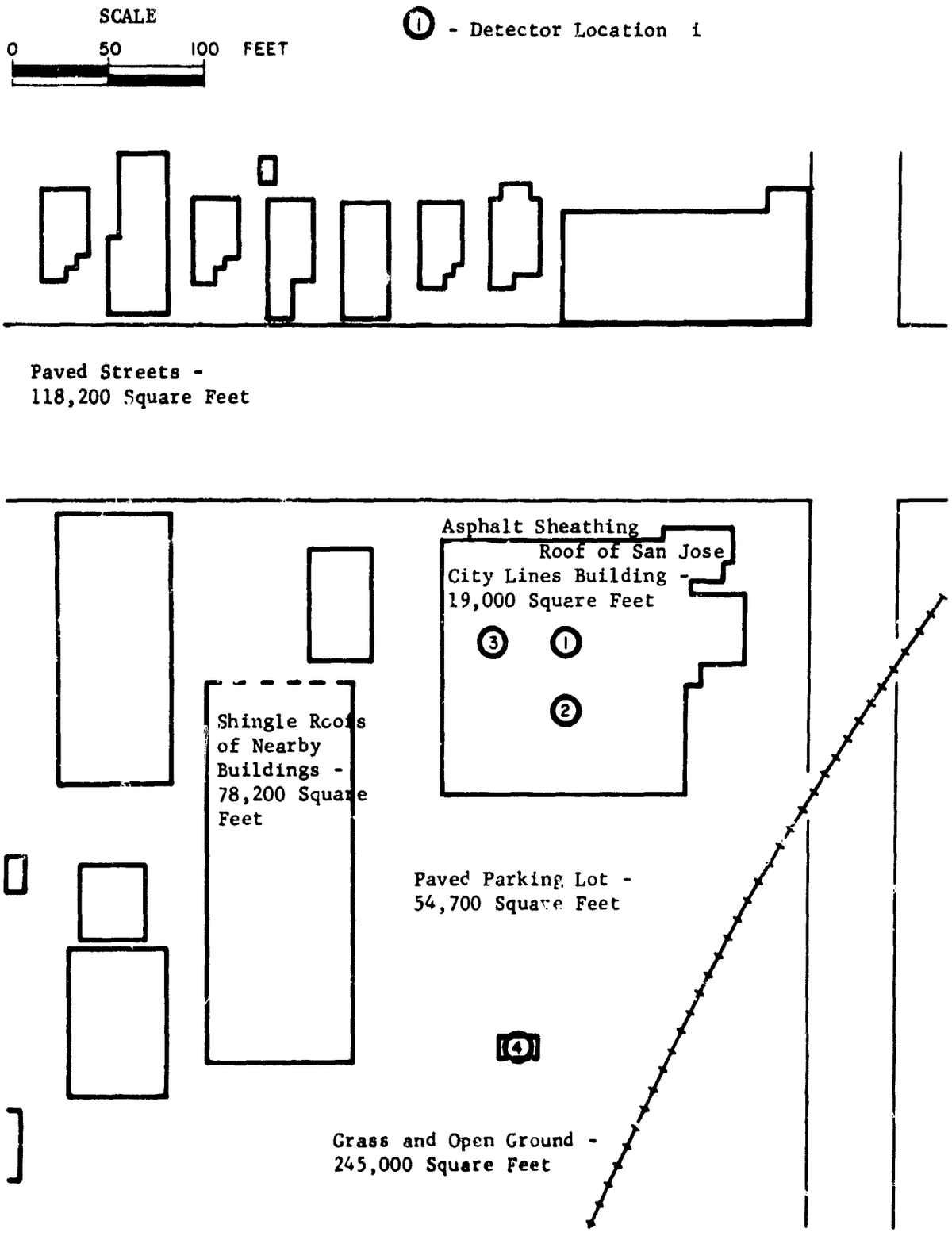


Figure 50

A Map of the Area Around San Jose City Lines Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

Figure 51

View 1 - San Jose City Lines - A Front View of the San Jose City Lines

Figure 52

View 2 - San Jose City Lines - A Back View of the San Jose City Lines

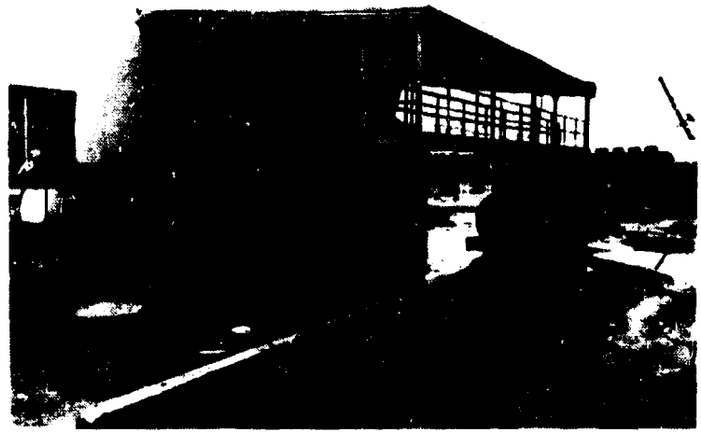


Figure 53

View 3 - San Jose City Lines - A View Showing the Side and the Drive-Under Shed

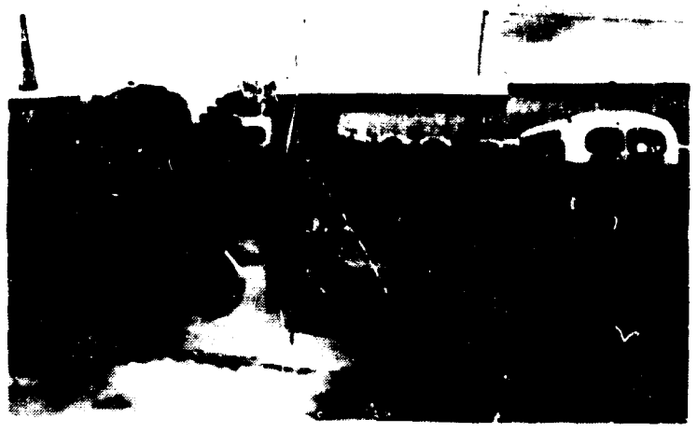


Figure 54

View 4 - San Jose City Lines - A View Showing the Gas and Oil Station

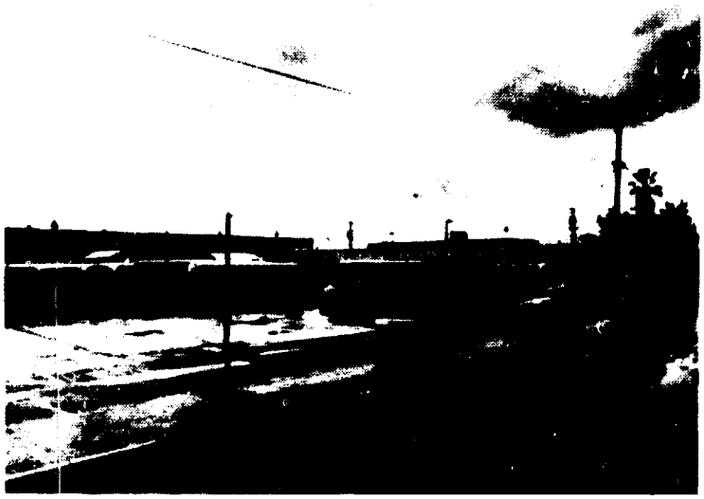


Figure 55

View 5 - San Jose City Lines - A View Showing the Bus Parking Area

Figure 56

View 6 - San Jose City Lines - Another View Showing the Bus Parking Area

Figure 57

View 7 - San Jose City Lines - A View Showing the Bus Parking Area and the Surrounding Vicinity

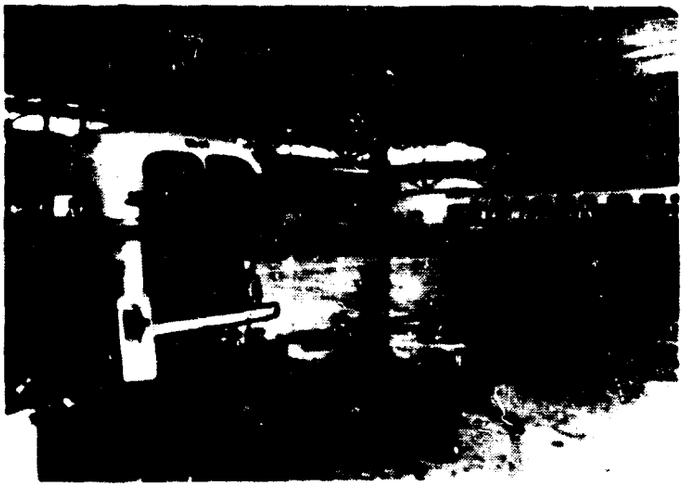


Figure 58

View 8 - San Jose City Lines - An Interior View of the San Jose City Lines Building

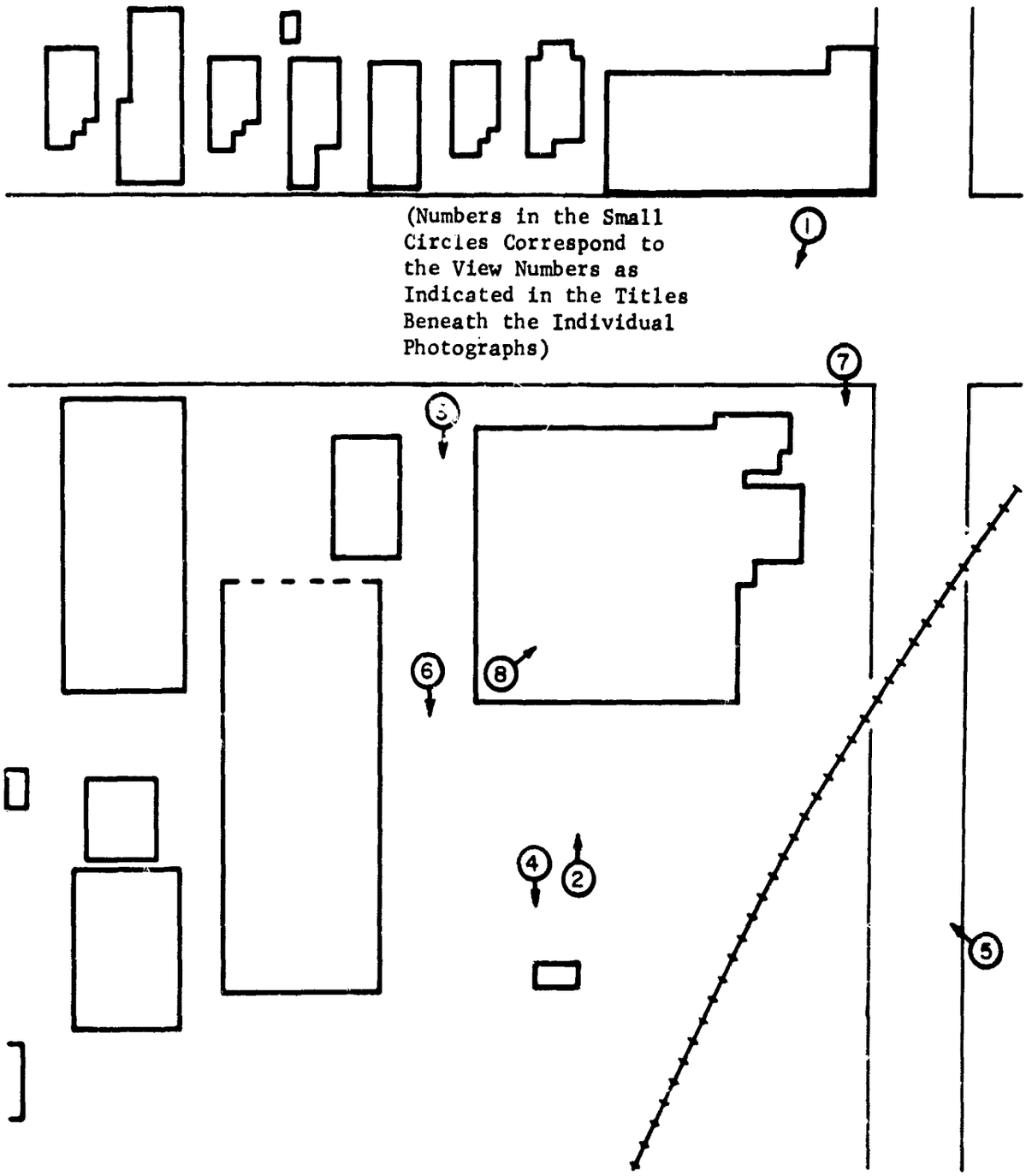


Figure 59

A Map of the Area Around San Jose City Lines Showing the Locations and Directions of the Photographs Shown in Figures 51 through 58

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table XXXVII defines the four activity patterns.

Table XXXVII

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN SAN JOSE CITY LINES

Activity A_i	Detector Location j				
	1 Repair Area A	2 Repair Area B	3 Repair Area C	4 Outdoor Gas & Oil Facility	5 Shelter Area
A_1	.30	.00	.05	.00	.65
A_2	.00	.13	.20	.00	.67
A_3	.00	.15	.00	.10	.75
A_4	.00	.00	.35	.00	.65

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 50)

Detector Location	Original PF
1 Repair Area A	2.0
2 Repair Area B	1.7
3 Repair Area C	2.0
4 Outdoor Gas & Oil Facility	2.0
5 Shelter Area	20

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table XXXVIII)	Equivalent PF
A_1	4.9
A_2	4.8
A_3	5.7
A_4	4.9

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of City Lines	19,000	Asphalt Sheathing
1B	Other Roofs	78,200	Shingles
2	Paved Parking	54,700	Asphalt
3	Streets	118,200	Asphalt
4	Lawns, Bare Earth, Fields, etc.	245,000	Grass & Ground

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contribution to intensity values:

1. Exterior Walls - 6" hollow concrete block (42 lb/ft^2)
2. Roof - Asphalt roofing on wooden planks (10 lb/ft^2)

Table XXXVIII lists the contribution to intensity factors of the various planes to the selected detector locations.

Table XXXVIII

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES) FOR SAN JOSE CITY LINES

Contaminated Plane i	Detector Location j				
	1 Repair Area A	2 Repair Area B	3 Repair Area C	4 Outdoor Gas & Oil Facility	5 Shelter Area *
1A Roof of City Lines	.3626	.3326	.3453	.0000	.0500
1B Other Roofs	.0002	.0001	.0001	.0000	.0000
2 Paved Parking	.0515	.1919	.0652	.3600	.0000
3 Streets	.0550	.0309	.0506	.0200	.0000
4 Grass & Ground	.0261	.0325	.0298	.1300	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table XXXIX.

Table XXXIX

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES) FOR SAN JOSE CITY LINES

Contaminated Plane i	Detector Location j				
	1 Repair Area A	2 Repair Area B	3 Repair Area C	4 Outdoor Gas & Oil Facility	5 Shelter Area *
1A Roof of City Lines	.73	.57	.70	.00	1.00
1B Other Roofs	.00	.00	.00	.00	.00
2 Paved Parking	.10	.33	.13	.71	.00
3 Streets	.11	.05	.10	.04	.00
4 Grass & Ground	.05	.06	.06	.25	.00

* Assumed Values

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table XL

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR SAN JOSE CITY LINES

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof of City Lines (1A)	.05	0.7	6
Vacuumized Sweeper	B	Parking Lots (2)	.09	1.1	1
Vacuumized Sweeper	C	Streets (3)	.09	2.4	1
Grading	D	Ground (4)	.10	58.1	1

H. RN_j Values

The fraction of intensity remaining for selected strategies of decontamination are given in Table XLI below.

Table XLI

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR SAN JOSE CITY LINES

Combined Strategy	Detector Location j				
	1 Repair Area A	2 Repair Area B	3 Repair Area C	4 Outdoor Gas & Oil Facility	5 Shelter Area
A	.30	.46	.33	1.00	.05
B	91	.70	.88	.36	1.00
C	.90	.95	.91	.96	1.00
D	.95	.95	.95	.77	1.00
B+C	.80	.66	.79	.32	1.00
A+B+C+D	.06	.07	.06	.09	.05

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table XLII.

Table XLII

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR SAN JOSE CITY LINES

Combined Strategy	Activity Pattern			
	A_1	A_2	A_3	A_4
A	.27	.33	.53	.29
B	.92	.83	.67	.90
C	.92	.94	.97	.92
D	.96	.96	.91	.95
B+C	.83	.77	.63	.82
A+B+C+D	.06	.06	.07	.06

J. Conclusions

Table XLI shows that the radiation intensity at any detector location can be reduced to a maximum of 9% of its original value by combined strategy A (firehosing roof of building), B (vacummized sweeping parking lots), C (vacummized sweeping streets), and D (grading the ground). If it is not felt vital to decontaminate for detector 4 (the outdoor gas and oil facility), decontamination method A+B+C would be sufficient. This is because the grass and ground contribute only a small amount of the relative intensity to any detector except detector 4. Judgment would have to be used to determine if decontamination of detector 4 is worth one man spending 58.1 hours grading the surrounding ground.

Only activity pattern A_3 requires a person to be at the outdoor gas and oil

facility. Therefore, this pattern would be the only activity that would not have the radiation reduced appreciably without decontamination method D.

IX. DECONTAMINATION ANALYSIS OF CITY CORPORATION YARD

A. Discussion

The San Jose City Corporation Yard, which is the maintenance and cleaning equipment depot for the city, occupies a complete city block. Within this area are two equipment storage buildings, a supply warehouse, a box and crate warehouse, a complete maintenance shop, and an office building. Decontamination of this area would be very important to postattack recovery because it is here that the city's street sweepers, flushers, etc. are stored. For this report, detectors were located in the maintenance shop and one of the equipment storage buildings. Figure 60 is a simplified diagram of the yard, showing the locations of the detectors and indicating the locations, sizes, and surface materials of contributing planes of contamination to the activity area. Figures 61 through 66 are a number of photographs taken around the yard area, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 67 is a map showing the locations and directions of the photographs.

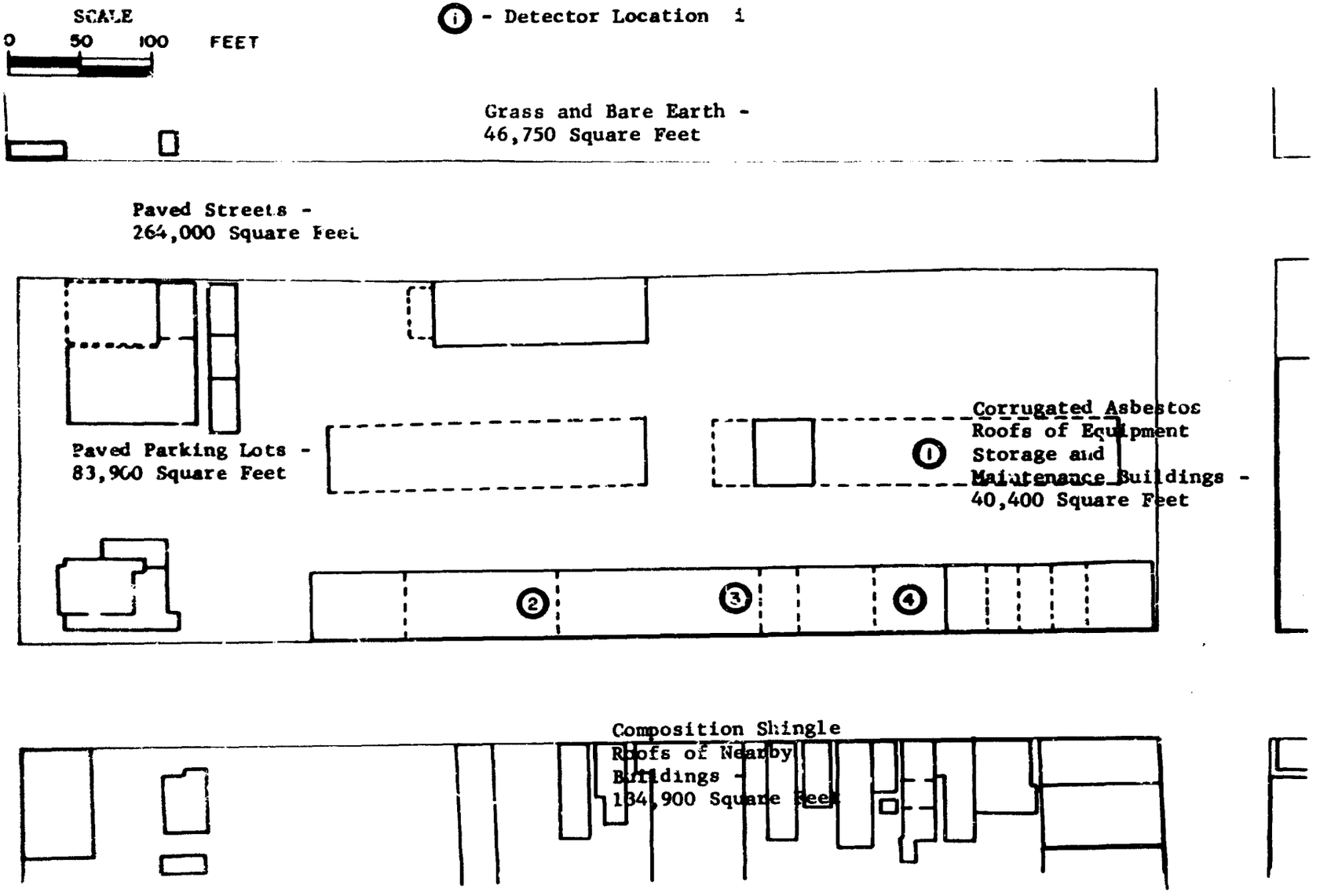


Figure 60

A Map of the Area Around City Corporation Yard Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

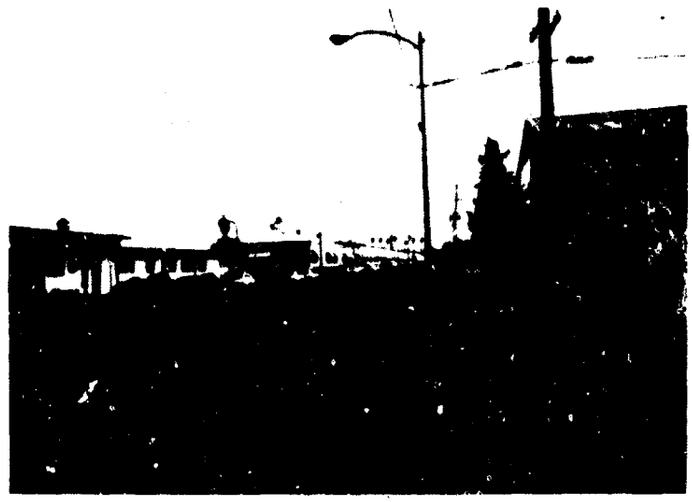


Figure 61

View 1 - City Corporation Yard -
View of Maintenance Building
on 6th Street

Figure 62

View 2 - City Corporation Yard -
View of Office

Figure 63

View 3 - City Corporation Yard -
Back View of Maintenance Building

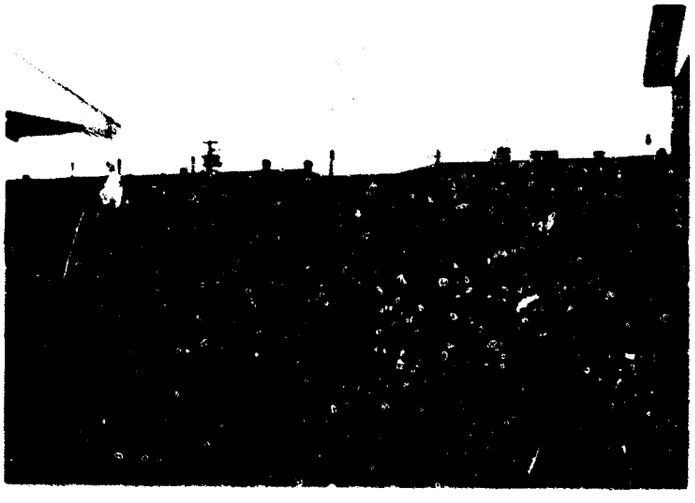


Figure 64

View 4 - City Corporation Yard -
View of an Equipment Storage Shed

Figure 65

View 5 - City Corporation Yard -
View of Equipment Kept in
Equipment Storage Shed

Figure 66

View 6 - City Corporation Yard -
Another View of Equipment Kept
in Equipment Storage Shed

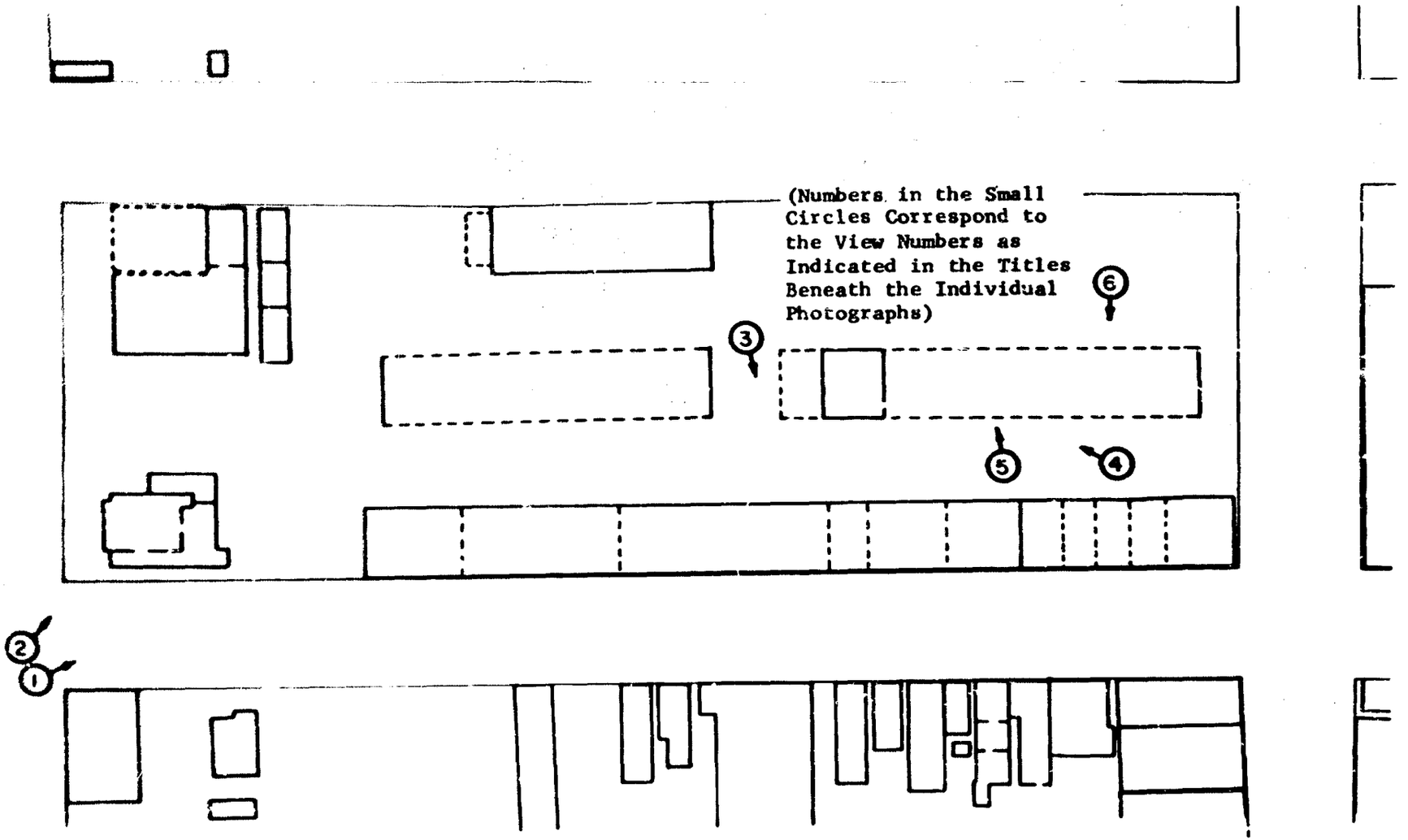


Figure 67

A Map of the Area Around City Corporation Yard Showing the Locations and Directions of the Photographs Shown in Figures 61 through 66

B. Definition of Activities

Four different activity patterns are considered in this analysis. Five detector locations are required to characterize the activities. These detector locations are as follows:

Detector Location	Description
1	Equipment Storage
2	Electrical Shop
3	Auto Repair Shop
4	Machine Shop
5	Shelter Area

The activities are described entirely according to the amount of time that the activity pattern requires a person to spend at each of the detector locations. The following table thus defines the four activity patterns:

Table XLIII

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN CITY CORPORATION YARDS

Activity Pattern A_i	Detector Location j				
	1 Equipment Storage	2 Electric Shop	3 Auto Repair	4 Machine Shop	5 Shelter Area
A_1	.10	.00	.00	.23	.67
A_2	.00	.20	.00	.10	.70
A_3	.20	.00	.15	.00	.65
A_4	.00	.10	.10	.10	.70

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 60)

Detector Location	Original PF
1 Equipment Storage Bldg.	2.48
2 Electrical Shop	3.75
3 Auto Repair Shop	7.19
4 Machine Shop	3.29
5 Shelter Area	20.00

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern-(See Table XLII)	Equivalent PF
A_1	6.96
A_2	8.42
A_3	7.47
A_4	9.44

D. Contaminated Planes

Identification Number	Description	Area Size (ft^2)	Surface Material
1A	Roof of Equipment Storage and Maintenance Bldgs.	40,400	Corrugated Asbestos*
1B	Other Roofs	134,900	Shingles
2	Paved Parking	83,950	Asphalt
3	Streets	264,000	Asphalt
4	Lawns, Bare Earth, Fields, etc.	46,750	Grass

* Assumed shingles for decontamination purposes

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the buildings which were required to calculate the contribution to intensity values:

1. Equipment Storage Building

   a. Exterior end walls - 8" cinder block (72 lb/ft^2)

   b. Exterior side walls - open

   c. Roof - 20 galvanized corrugated asbestos (2 lb/ft^2)

2. Maintenance Building

   a. Exterior walls - 8" cinder block (72 lb/ft^2)

   b. Interior partitions - 6" cinder block (54 lb/ft^2)

   c. Roof - corrugated asbestos (4 lb/ft^2)

Table XIV lists the contribution to intensity factors of the various planes to the selected detector locations.

Table XLIV

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES)
FOR CITY CORPORATION YARD

Contaminated Plane i	Detector Location j				
	1 Equipment Storage Building	2 Electrical Shop	3 Auto Repair Shop	4 Machine Shop	5 Shelter Area
1 A Roof of Bldg.	.1908	.1963	.0685	.2324	.0500
1 B Other Roofs	.0000	.0000	.0000	.0000	.0000
2 Paved Parking	.2039	.0463	.0460	.0427	.0000
3 Streets	.0078	.0239	.0244	.0288	.0000
4 Grass and Ground	.0000	.0001	.0001	.0001	.0000

F. Relative Intensity Contribution (CF_{ij} Values)

The relative intensity contributions are given in Table XLV.

Table XLV

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES) FOR CITY CORPORATION YARD

Contaminated Plane i	Detector Location j				
	1 Equipment Storage Building	2 Electrical Shop	3 Auto Repair Shop	4 Machine Shop	5 Shelter Area
1A Roof of Bldgs.	.47	.74	.49	.76	1.00
1B Other Roofs	.00	.00	.00	.00	.00
2 Paved Parking	.51	.17	.33	.14	.00
3 Streets	.02	.09	.18	.09	.00
4 Grass and Ground	.00	.00	.00	.00	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table XLVI

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR CITY CORPORATION YARD

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roofs of Equipment Storage & Maintenance Bldgs. (1A)	.07	1.70	7
Vacuumized Sweeper	B	Parking Lots (2)	.09	1.65	1
Vacuumized Sweeper	C	Streets (3)	.09	5.30	1

H. RN_A Values

The fraction of intensity remaining for selected strategies of decontamination are given in Table XLVII below.

Table XLVII

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR CITY CORPORATION YARD

Combined Strategy	Detector Location j				
	1 Equipment Storage Building	2 Electrical Shop	3 Auto Repair Shop	4 Machine Shop	5 Shelter Area
A	.56	.32	.54	.29	.07
B	.54	.84	.70	.87	1.00
C	.98	.92	.84	.91	1.00
B+C	.52	.76	.54	.79	1.00
A+B+C	.08	.08	.08	.08	.07

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table XLVIII.

Table XLVIII

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR CITY CORPORATION YARD

Combined Strategy	Activity Pattern			
	A_1	A_2	A_3	A_4
A	.31	.24	.44	.26
B	.81	.90	.68	.88
C	.95	.94	.96	.93
B+C	.76	.84	.64	.82
A+B+C	.08	.07	.06	.07

J. Conclusions

The roofs of other buildings and the surrounding grass and ground do not offer any relative intensity contributions to the detector locations. Therefore, it is unnecessary to consider decontaminating these planes.

Table XLVII and XLVIII show that the combined decontamination strategy A (fire-hosing roofs of equipment storage and maintenance buildings), B (vacuumized sweeping parking lots), and C (vacuumized sweeping of streets) would reduce the fraction of intensity remaining at any detector location or for any activity pattern to a maximum of 8%.

Further, Table XLVI shows the above strategy can be accomplished in a relatively short time with a maximum of nine men.

X. DECONTAMINATION ANALYSIS OF FIRE STATION NO. 8

A. Discussion

Fire Station No. 8 is located in a surburban area of San Jose. In a postattack situation the station's continual operation could be of considerable value to the community.

Figure 68 is a simplified diagram of the station, showing the locations of detectors and indicating the locations, sizes and surface materials of the contributing planes of contamination to the activity area. Figures 69 through 74 are a number of photographs taken around the station area, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 75 is a map showing the locations and directions of the photographs.

B. Definition of Activities

Three different activity patterns are considered in this analysis. Three detector locations are used to characterize these activity patterns. The detector locations are as follows:

Detector Location	Description
1	Equipment Storage Area
2	Alarm Switchboard
3	Shelter Area

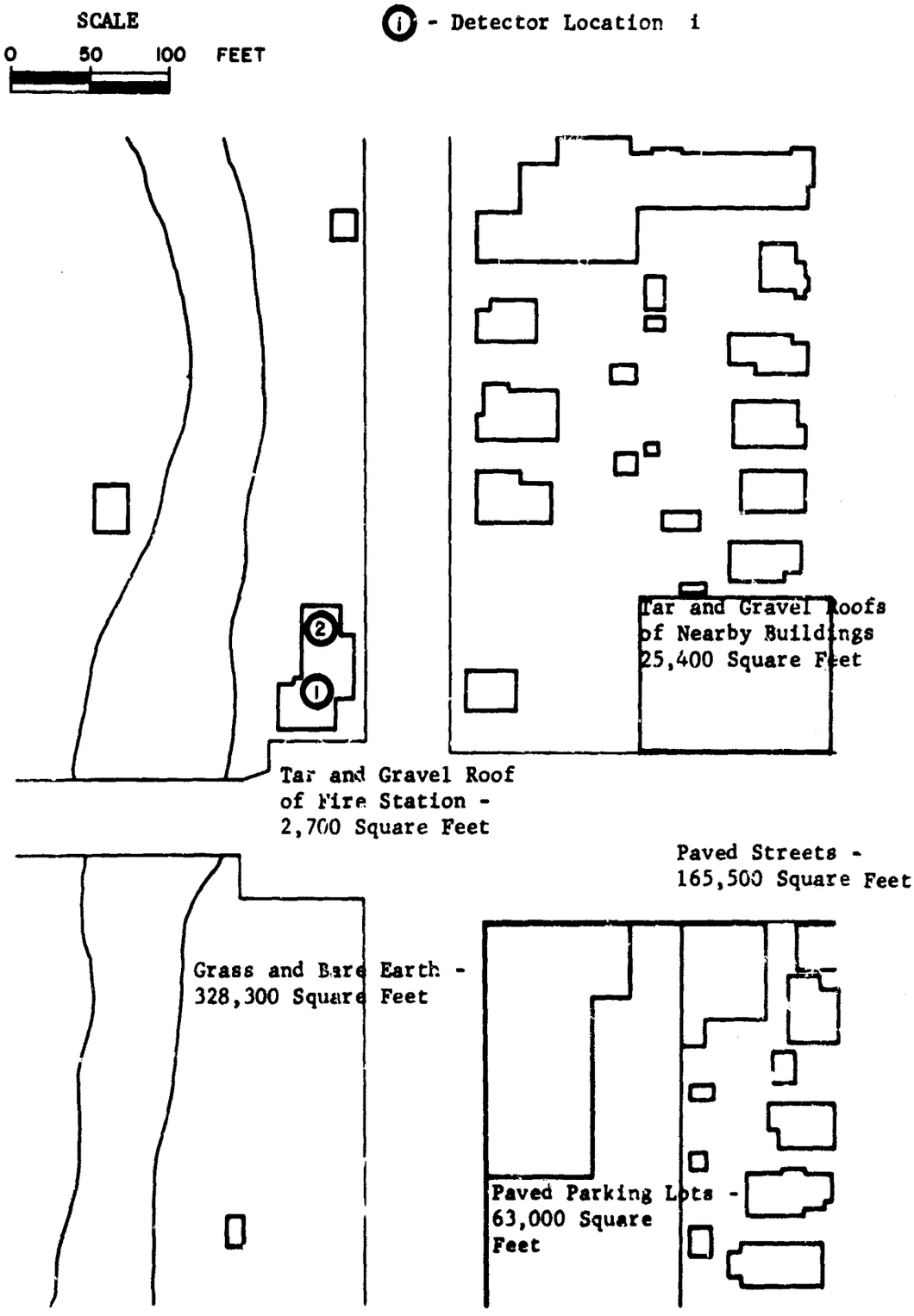


Figure 68

A Map of the Area Around Fire Station No. 8 Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

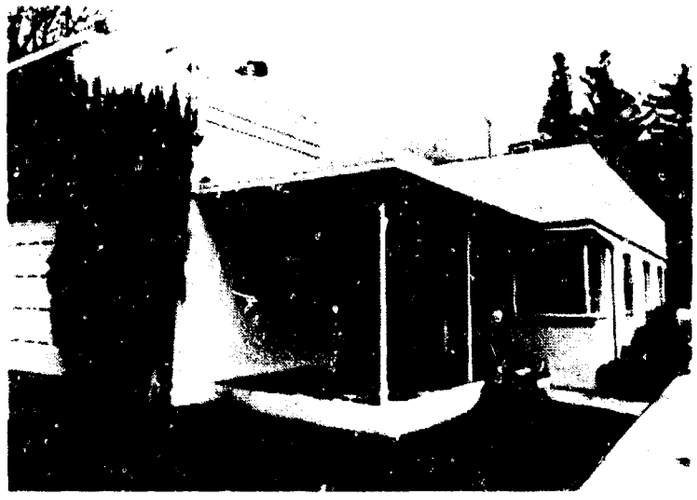


Figure 69

View 1 - Fire Station No. 8 -
A View of the Entrance
to the Fire Station

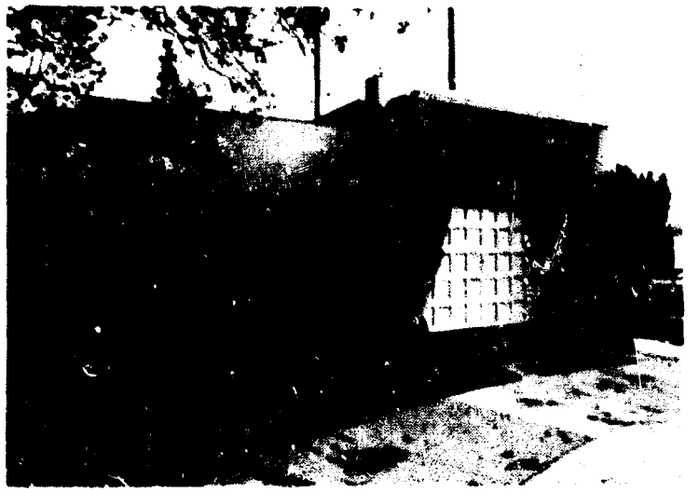


Figure 70

View 2 - Fire Station No. 8 -
A View of the Truck Entrance
to the Fire Station

Figure 71

View 3 - Fire Station No. 8 -
A View of the Fire Station and
Some of the Surrounding Area

Figure 72

View 4 - Fire Station No. 8 -
A Back View of the Fire Station
and the Parking Area

Figure 73

View 5 - Fire Station No. 8 -
A View of the Bank of the Creek
Running Alongside of the Fire Station

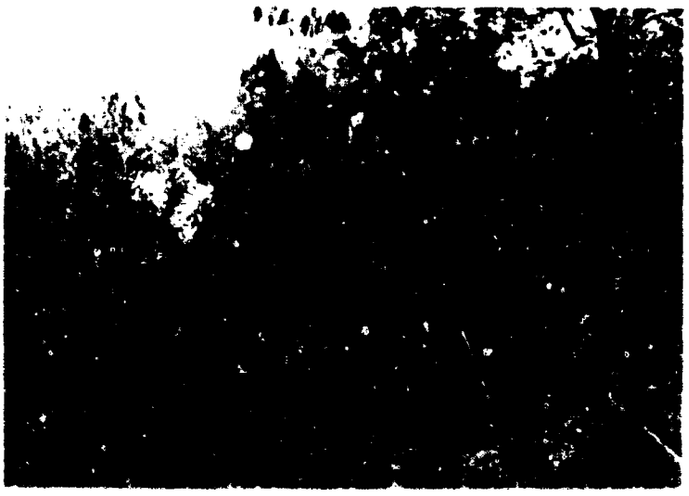
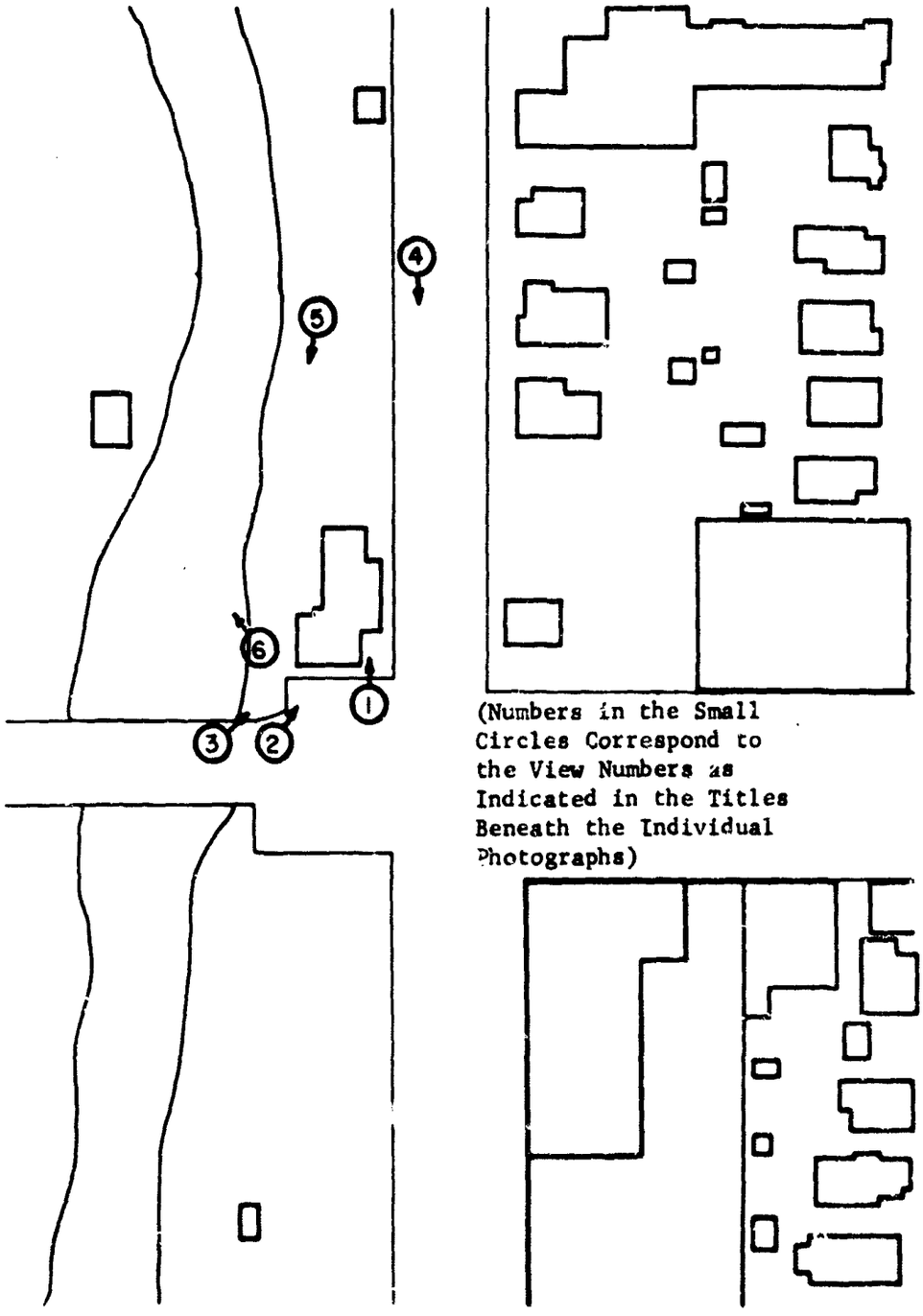


Figure 74

View 6 - Fire Station No. 8 -
A View of Heavy Growth Surrounding the
Creek Alongside the Fire Station



(Numbers in the Small Circles Correspond to the View Numbers as Indicated in the Titles Beneath the Individual Photographs)

Figure 75

A Map of the Area Around Fire Station No. 8 Showing the Locations and Directions of the Photographs Shown in Figures 69 through 74

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table XLIX defines the three activity patterns.

Table XLIX

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i
TO BE SPENT AT DETECTOR LOCATION j IN FIRE STATION NO. 8

Activity A_i	Detector Location j		
	1 Equipment Storage Area	2 Alarm Switchboard	3 Shelter Area
A_1	.35	.00	.65
A_2	.10	.20	.70
A_3	.00	.40	.60

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 68)

Detector Location	Original PF
1 Equipment Storage Area	5.5
2 Alarm Switch	9.2
3 Shelter Area	50

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table XLIX)	Equivalent PF
A_1	13
A_2	18
A_3	18

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of Fire Station	2,700	Tar & Gravel
1B	Other Roofs	25,400	Tar & Gravel
2	Paved Parking	63,000	Asphalt
3	Streets	165,500	Asphalt
4	Lawns, Bare Earth, Fields, etc.	328,300	Grass & Bare Earth

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contribution to intensity values:

1. Exterior walls - brick and block (68 lb/ft^2)
2. Roof - 5" reinforced concrete (62 lb/ft^2)

Table L lists the contribution to intensity factors of the various planes to the selected detector locations.

Table L

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES) FOR FIRE STATION NO. 8

Contaminated Plane i	Detector Location j		
	1 Equipment Storage Area	2 Alarm Switchboard	3 Shelter Area
1A Roof of Fire Station	.0424	.0424	.0200
1B Other Roofs	.0000	.0000	.0000
2 Paved Parking	.0011	.0009	.0000
3 Streets	.1282	.0397	.0000
4 Grass & Ground	.0116	.0262	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table LI below.

Table LI

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
FOR FIRE STATION NO. 8

Contaminated Plane i	Detector Location j		
	1 Equipment Storage Area	2 Alarm Switchboard	3 Shelter Area
1A Roof of Fire Station	23	.39	1.00
1B Other Roofs	.00	.00	.00
2 Paved Parking	.01	.01	.00
3 Streets	.70	.36	.00
4 Grass & Ground	.06	.24	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table LII

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR FIRE STATION NO. 8

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof of Fire Station (1A)	.03	0.2	7
Grading	B	Ground (4)	.10	79.2	1
Firehosing	C	Streets (3)	.03	11.5	7
Firehosing	D	Parking Lots (2)	.03	4.1	7

H. RN_j Values

The fraction of intensity remaining for selected strategies of decontamination is given in Table LIII below.

Table LIII

FRACTION OF INTENSITY REMAINING (RN_j VALUES)
FOR SELECTED STRATEGIES FOR FIRE STATION NO. 8

Combined Strategy	Detector Location j		
	1 Equipment Storage Area	2 Alarm Switchboard	3 Shelter Area
A	.76	.62	.03
B	.94	.78	1.00
C	.32	.65	1.00
D	.99	.99	1.00
A+B	.72	.41	.03
A+C	.10	.27	.03
B+C	.26	.43	1.00
A+B+C	.04	.05	.03
A+B+C+D	.03	.05	.03

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table LIV.

Table LIV

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR FIRE STATION NO. 8

Combined Strategy	Activity Pattern		
	A_1	A_2	A_3
A	.65	.52	.50
B	.95	.89	.83
C	.44	.63	.72
D	1.00	.99	.99
A+B	.60	.42	.33
A+C	.09	.15	.22
B+C	.39	.52	.55
A+B+C	.04	.04	.05
A+B+C+D	.03	.04	.04

J. Conclusions

Tables LIII and LIV show that combined strategy A (firehosing roofs of fire station) B (grading the ground), and C (firehosing the streets) will reduce the radiation at any detector location or for any activity pattern to a maximum of 5% of its original value. Table LIII also shows that strategy D is, for all practical purposes, of no value.

Attention is brought to the wide variation of the contamination to the various detectors from the various planes, as shown in Table LI.

XI. DECONTAMINATION ANALYSIS OF RADIO STATION KXRX

A. Discussion

This small radio station is located just outside of the city of San Jose on a hill overlooking a highway. The station has an above ground fallout shelter attached to the main building. The station's ability to broadcast in a postattack situation could be vital as a means of informing the population of the state of the environment.

Figure 76 is a simplified diagram of the station showing the locations of the detectors and indicating the locations, sizes, and surface materials of contributing planes of contamination to the activity area. Figures 77 through 80 are a number of photographs taken around the area, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 81 is a map showing the locations and directions of the photographs.

B. Definition of Activities

Four activity patterns are considered in this analysis. Four detector locations are used to characterize these activities. These detector locations are as follows:

Detector Location	Description
1	Broadcasting Studio
2	Engineering Room
3	Office
4	Fallout Shelter

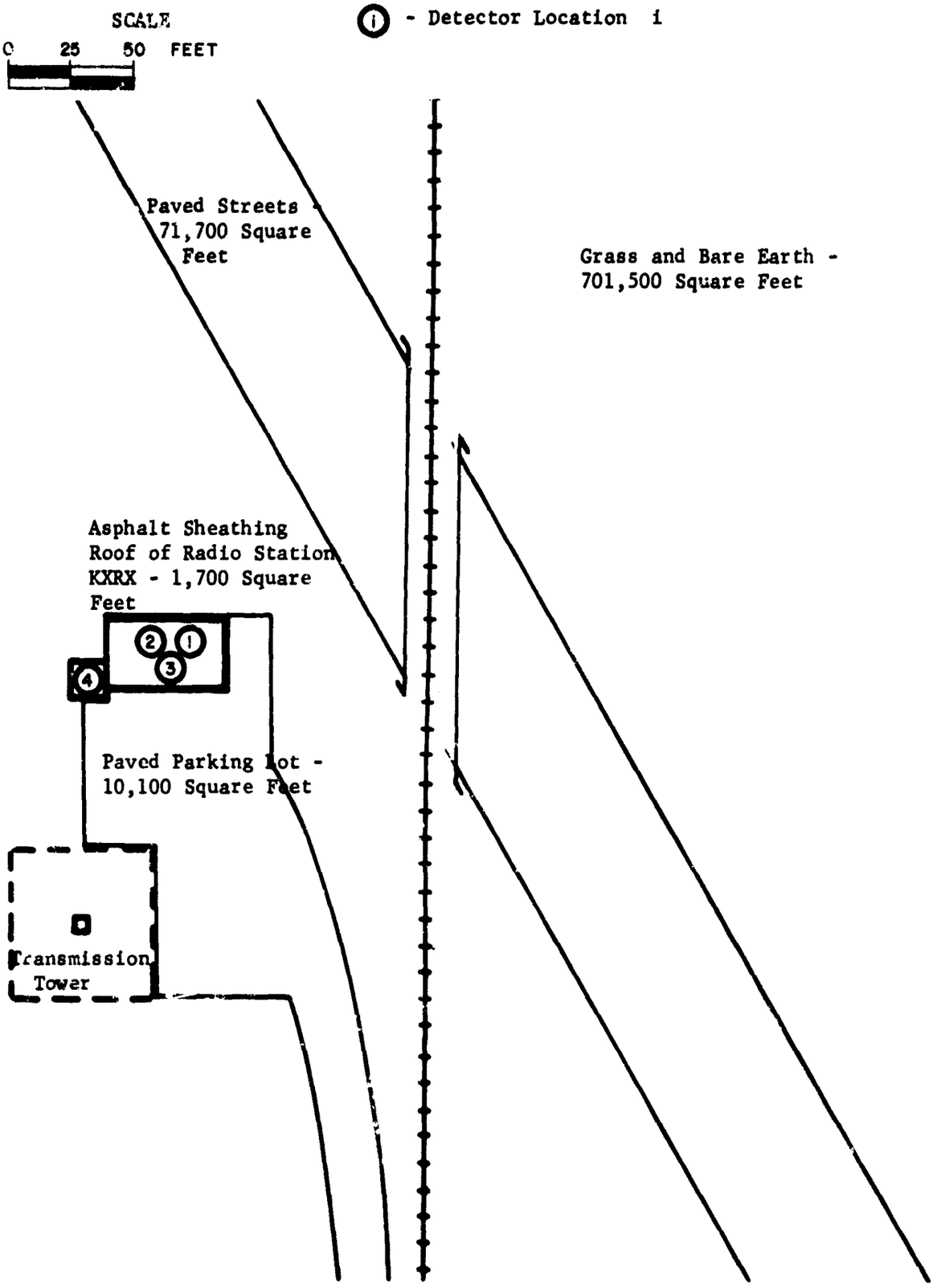


Figure 76

A Map of the Area Around Radio Station KXRX Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentialiy Contributing Contaminated Planes

Figure 77

View 1 - Radio Station KXRX -
A View of the Front
of the Radio Station

Figure 78

View 2 - Radio Station KXRX -
A View of the Station Transmission
Towers and the Surrounding Area

Figure 79

View 3 - Radio Station KXRX -
A View Showing the Fallout Shelter
Adjoining the Side of the Station

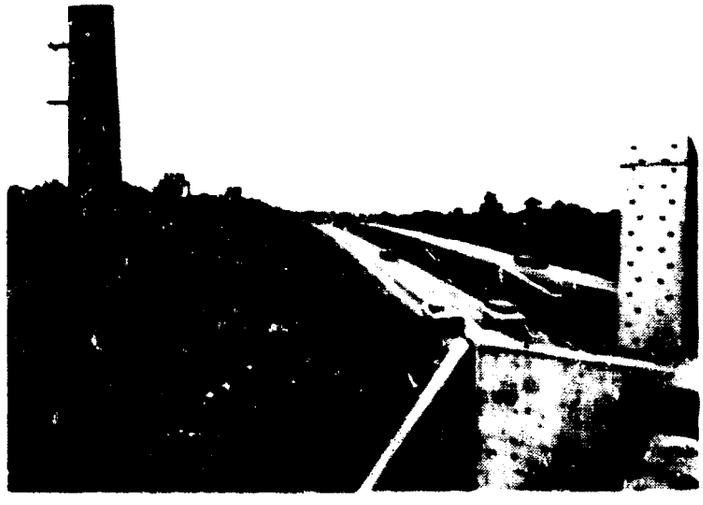


Figure 80

View 4 - Radio Station KXRX -
A View Showing the Slopes of
Ground from the Radio Station
to the Freeway

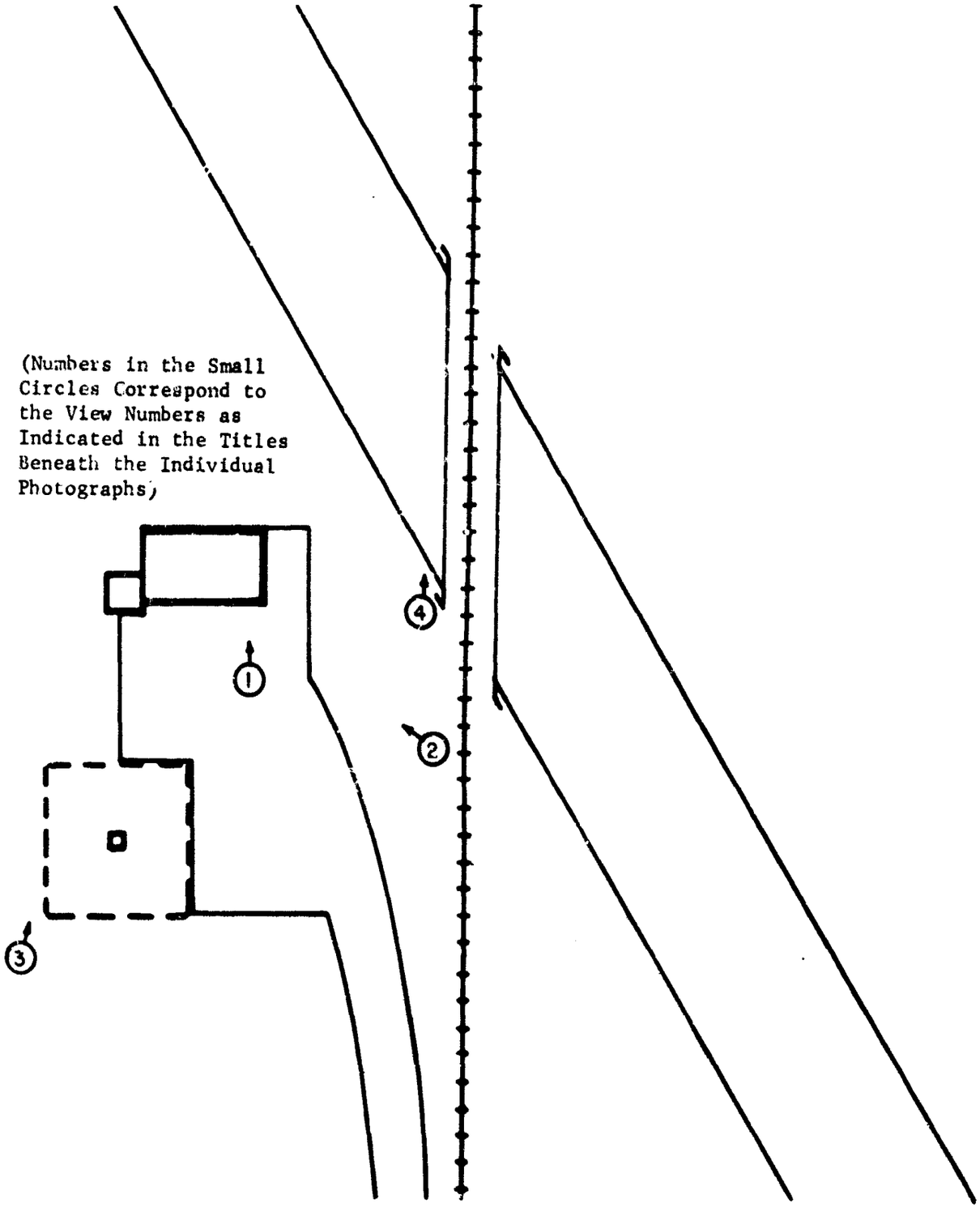


Figure 81

A Map of the Area Around Radio Station KXRX Showing the Locations and Directions of the Photographs Shown in Figures 77 through 80

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each detector location. Thus, Table LV defines the four activity patterns.

Table LV

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN RADIO STATION KXRX

Activity Pattern A_i	Detector Location j			
	1 Broadcasting Studio	2 Engineering Room	3 Office	4 Shelter Area
A_1	.31	.00	.02	.67
A_2	.00	.33	.00	.67
A_3	.18	.15	.00	.67
A_4	.00	.20	.15	.65

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 76)

Detector Location	Original PF
1 Broadcasting Studio	1.4
2 Engineering Room	1.7
3 Office	1.7
4 Shelter Area	8.0

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table LV)	Equivalent PF
A_1	3.2
A_2	3.6
A_3	3.3
A_4	3.5

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of KXRX	1,700	Asphalt Sheathing*
1B	Other Roofs	-----	------
2	Paved Parking	10,100	Asphalt
3	Streets	71,700	Asphalt
4	Lawns, Bare Earth, Fields, etc.	701,500	Grass & Ground

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the radio station which were required to calculate the contribution to intensity values.

1. Exterior walls
   a. Main building - 2" timber planks (7 lb/ft^2)
   b. Shelter area - 8" cinder block (72 lb/ft^2)
2. Roof
   a. Main building - asphalt sheathing on timber (10 lb/ft^2)
   b. Shelter area - 6" reinforced concrete (75 lb/ft^2)

* Considered shingles for decontamination purposes.

Table LVI lists the contribution to intensity factors of the various planes to the selected detector locations.

Table LVI

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES) FOR RADIO STATION KXRX

Contaminated Plane i	Detector Location j: 1 Broadcasting Studio	2 Engineering Room	3 Office	4 Shelter Area
1A Roof of KXRX	.1542	.1545	.1545	.0022
1B Other Roofs	.0000	.0000	.0000	.0000
2 Paved Parking	.1863	.0821	.2193	.0313
3 Streets	.0011	.0007	.0014	.0000
4 Grass & Ground	.3656	.3507	.2105	.0920

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table LVII below.

Table LVII

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES) FOR RADIO STATION KXRX

Contaminated Plane i	Detector Location j: 1 Broadcasting Studio	2 Engineering Room	3 Office	4 Shelter Area
1A Roof of KXRX	.22	.26	.26	.02
1B Other Roofs	.00	.00	.00	.00
2 Paved Parking	.26	.14	.37	.25
3 Streets	.00	.00	.00	.00
4 Grass & Ground	.52	.60	.36	.73

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table LVIII

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR RADIO STATION KXRX

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof of KXRX (1A)	.05	0.1	6
Firehosing	B	Paved Parking (2)	.03	0.2	5
Vacuumized Sweeper	C	Streets (3)	.09	1.4	1
Grading	D	Ground (4)	.10	168.0	1

H. RN_j Values

The fraction of intensity remaining for selected strategies is given in Table LIX.

Table LIX

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR RADIO STATION KXRX

Combined Strategy	Detector Location j			
	1 Broadcasting Studio	2 Engineering Room	3 Office	4 Shelter Area
A	.79	.75	.75	.98
B	.74	.86	.64	.76
C	1.00	1.00	1.00	1.00
D	.53	.46	.68	.34
A+B+C	.54	.61	.38	.74
A+B+D	.07	.08	.06	.08

I. RN_A Values

The activity reduction factors for selected strategies and all the activity patterns are given in Table LX.

Table LX

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR RADIO STATION KXRX

Combined Strategy	Activity Patterns			
	A_1	A_2	A_3	A_4
A	.84	.82	.83	.82
B	.74	.83	.78	.76
C	1.00	1.00	1.00	1.00
D	.49	.43	.46	.49
A+B+C	.59	.65	.62	.58
A+B+D	.07	.08	.08	.07

J. Conclusions

Tables LIX and LX show that combined strategy A (firehosing the roof of the radio station), B (firehosing the paved parking), and D (grading the surrounding ground) reduces the fraction of intensity remaining at any detector location or for any activity pattern to a maximum of 8% of its original value. The most time consuming part of this decontamination process is grading the ground, which requires one man 168 hours to accomplish. The grading is necessary because the surrounding grass and ground offer over 50% of the relative intensity contribution to all detector locations except detector 3 (office).

It is interesting to note that, even though the radio station has an annex that is considered to be an above ground shelter, the calculated PF of this shelter is only 7.97

XII. DECONTAMINATION ANALYSIS OF OUTDOOR AREAS IN A RESIDENTIAL AREA

A. Discussion

In order to analyze the decontamination of outdoor areas in a residential area in San Jose, a typical surburan section was chosen. Detector locations (representing people) were placed outdoors in the center of a street and in a yard.

Figure 82 is a simplified diagram of the area chosen, showing the locations of the detectors and indicating the locations, sizes, and surface materials of contributing planes of contamination to the activity area. Figures 83 through 87 are a number of photographs of a typical residential area, showing some of the contaminated planes and other features of the area that would influence decontamination.

B. Definition of Activities

Two different activity patterns are considered in this analysis. Three detector locations are used to characterize these activity patterns. These detector locations are as follows:

Detector Location	Description
1	Street
2	Yard
3	Shelter Area

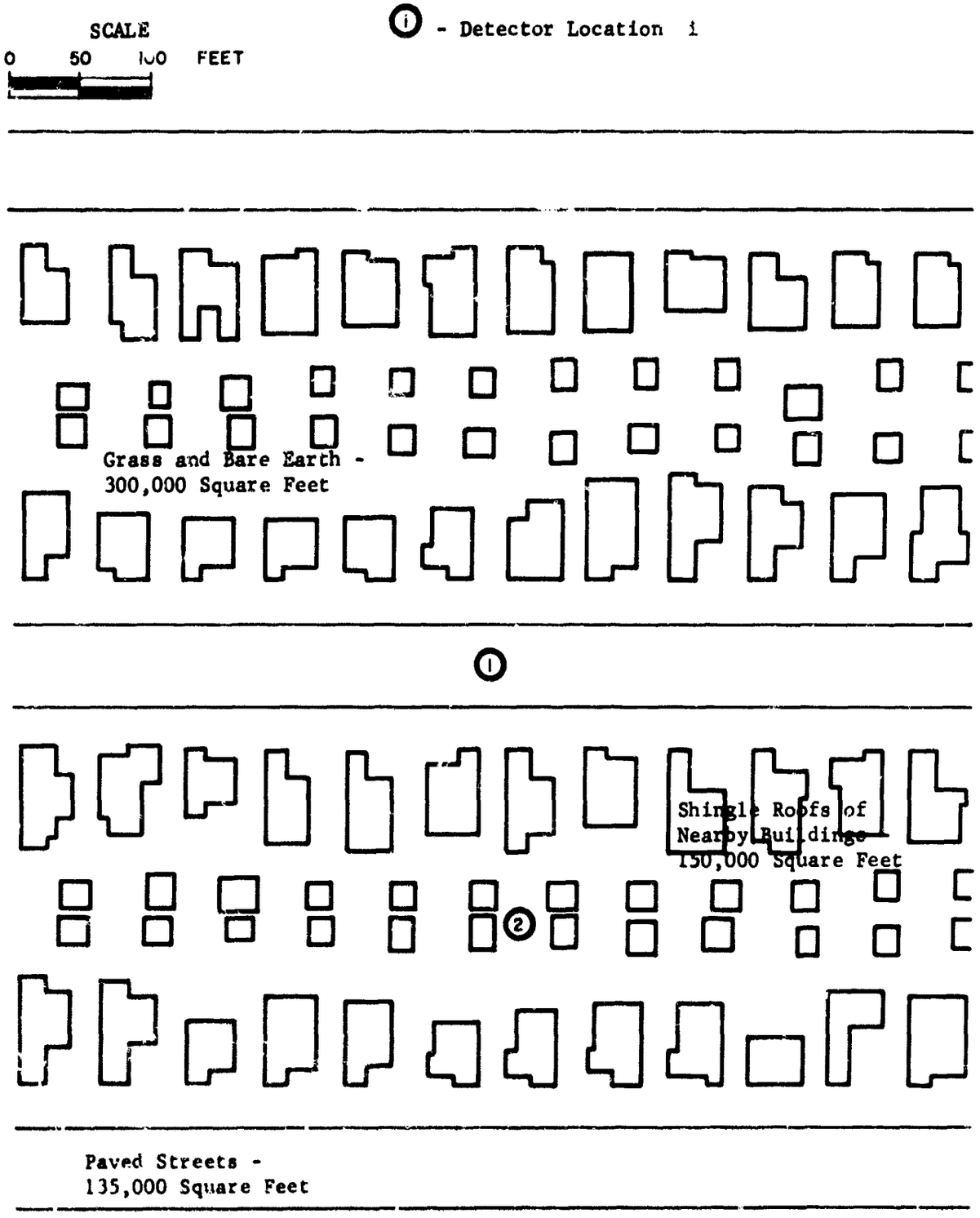


Figure 82

A Map of the Area Around Residential Area Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

Figure 83

View 1 - Residential Area -
A View Showing a
Typical Intersection

Figure 84

View 2 - Residential Area -
A View Showing a
Typical Street

Figure 85

View 3 - Residential Area -
A View Showing a
Typical Home

Figure 86

View 3 - Residential Area -
A View Showing the Typical
Closeness of the Homes

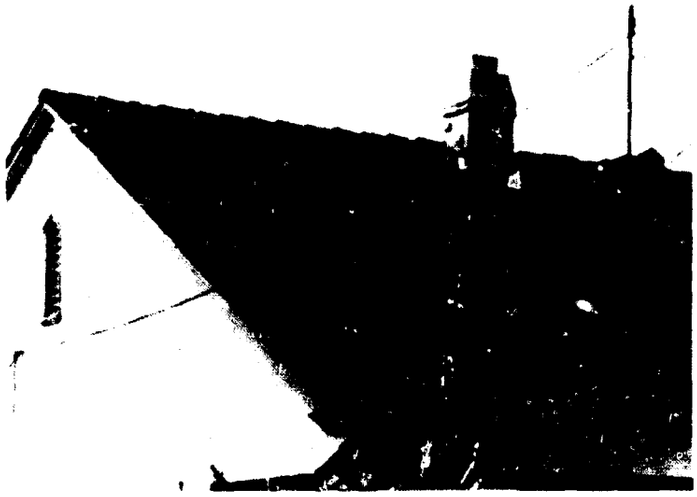


Figure 87

View 5 - Residential Area -
A View Showing a Typical
Shingle Roof

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table LXI defines the two activity patterns.

Table LXI

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN A RESIDENTIAL AREA

Activity A_i	Detector Location j		
	1 Street	2 Yard	3 Shelter Area
A_1	.30	.00	.70
A_2	.00	.25	.75

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 82)

Detector Locations	Original PF
1 Street	1.6
2 Yard	1.8
3 Shelter Area	20

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table LXI)	Equivalent PF
A_1	4.4
A_2	5.7

D. Contaminating Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of Bldg.	None	-------
1B	Roof of Other Bldgs.	150,000	Shingles
2	Paved Parking	None	-------
3	Streets	135,000	Asphalt
4	Lawns, Bare Earth, Fields, etc.	300,000	Grass and Bare Earth

E. Contribution to Intensity Factors (C_{ij} Values)

Because the existance of a shelter area is assumed and the other two detector locations are outdoors, there were no building structural characteristics to be considered.

Table LXII lists the contribution to intensity of the various planes to the selected detector locations.

Table LXII

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES) FOR A RESIDENTIAL AREA

Contaminated Plane i	Detector Location j		
	1 Street	2 Yard	3 Shelter Area
1B Roofs of Other Bldgs.	.0749	.1635	.0500
2 Paved Parking	.0000	.0000	.0000
3 Streets	.2264	.0195	.0000
4 Grass & Ground	.3320	.3641	.0000

F. Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table LXIII below.

Table LXIII

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES) TO A RESIDENTIAL AREA

Contaminted Plane i	Detector Location j		
	1 Street	2 Yard	3 Shelter Area
1B Roofs of Other Buildings	.12	.30	1.00
2 Paved Parking	.00	.00	.00
3 Streets	.36	.04	.00
4 Grass & Ground	.52	.67	.00

G. Cost and Effectiveness

Cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table LXIV

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR A RESIDENTIAL AREA

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Other Roofs (1B)	.05	5.0	6
Firehosing	B	Streets (3)	.03	1.8	5
Street Sweeper	C	Streets (3)	.06	2.7	1
Grading	D	Ground (4)	.10	72.0	1

H. RN_j Values

The fraction of intensity remaining for selected strategies is given in Table LXV below.

Table LXV

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR A RESIDENTIAL AREA

Combined Strategy	Detector Location j		
	1 Street	2 Yard	3 Shelter Area
A	.89	.72	.05
B	.65	.97	1.00
C	.66	.97	1.00
D	.53	.40	1.00
A+B+D	.07	.08	.05
A+C+D	.08	.08	.05

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table LXVI.

Table LXVI

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR A RESIDENTIAL AREA

Combined Strategy	Activity Pattern	
	A_1	A_2
A	.76	.57
B	.71	.97
C	.72	.97
D	.60	.53
A+B+D	.07	.08
A+C+D	.08	.08

J. Conclusions

Table LXV shows that combined strategies A (firehosing roofs of houses), B (firehosing streets), and D (grading the ground) and A, D, and C (street sweeping the streets) are for all practical purposes equally efficient with respect to reducing radiation. Strategy C has the advantage that it requires only one man to work 2.7 hours while strategy B requires five men to work 1.8 hours. The most time consuming part of the decontamination process is grading the ground which requires one man to work 72 hours.

It is interesting to note that whether a man is considered to be in the street or in a yard the surrounding grass and ground contribute over 50% of the radiation he receives.

XIII. DECONTAMINATION ANALYSIS OF OUTDOOR LOCATIONS IN THE CENTRAL BUSINESS DISTRICT

A. Discussion

In order to analyze the decontamination of the central business district in San Jose, detector locations (representing people) were placed in two downtown outdoor areas. One of these detectors was placed in an intersection and another in a parking lot.

Figures 88 and 89 are simplified diagrams of central business areas, showing the locations of detectors and indicating the locations, sizes, and surface materials of some of the contributing planes of contamination to the various activity areas. Figures 90 through 97 are a number of photographs showing typical downtown areas and some of the contaminated planes and other features that would influence decontamination.

B. Definition of Activities

Three different activity patterns are considered in this analysis. Three detector locations are used to characterize these activity patterns. These detector locations are as follows:

Detector Location	Description
1	Intersection
2	Parking Lot
3	Shelter Area

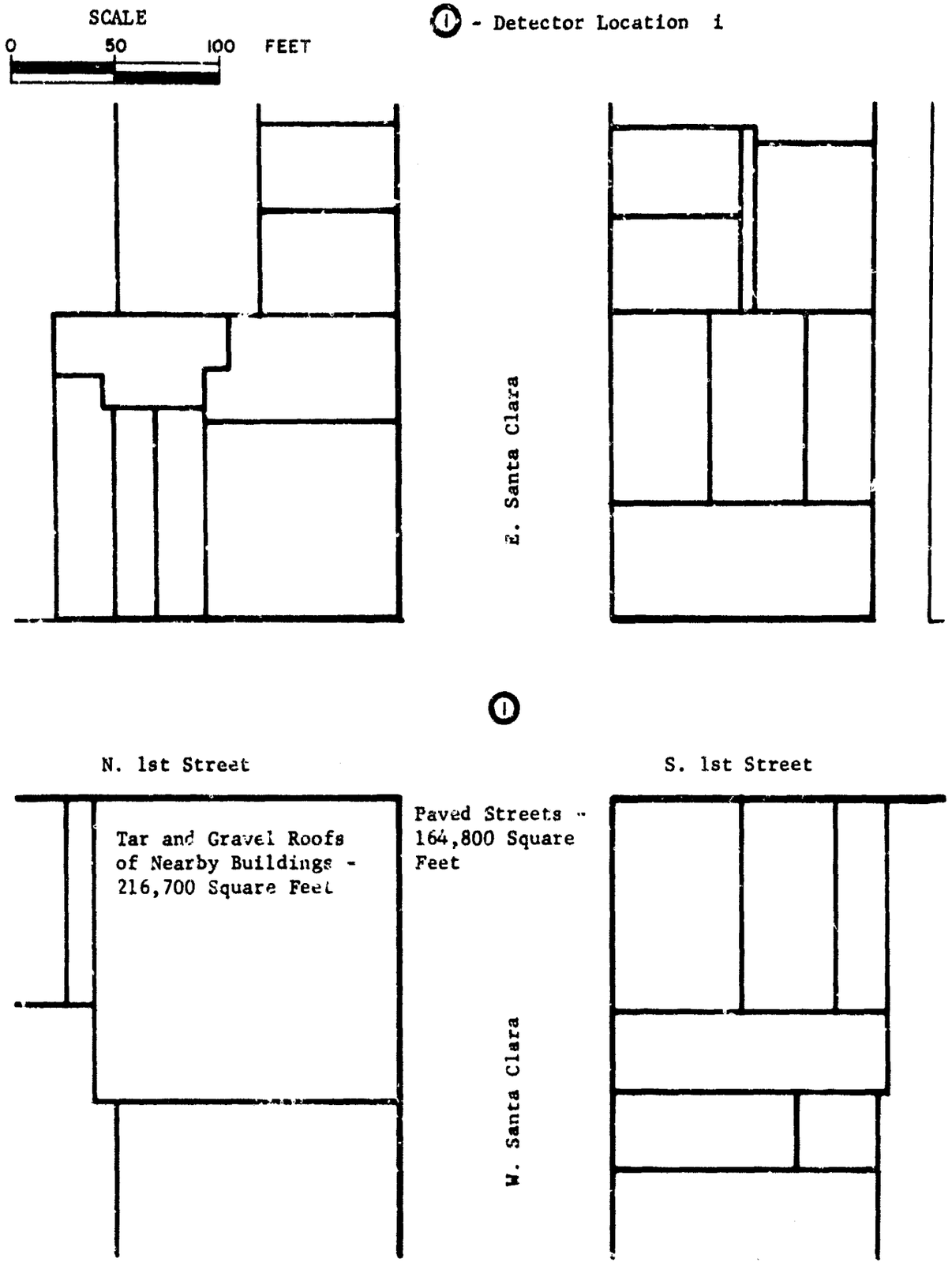


Figure 88

A Map of the Area Around Main Intersection in San Jose Business District Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

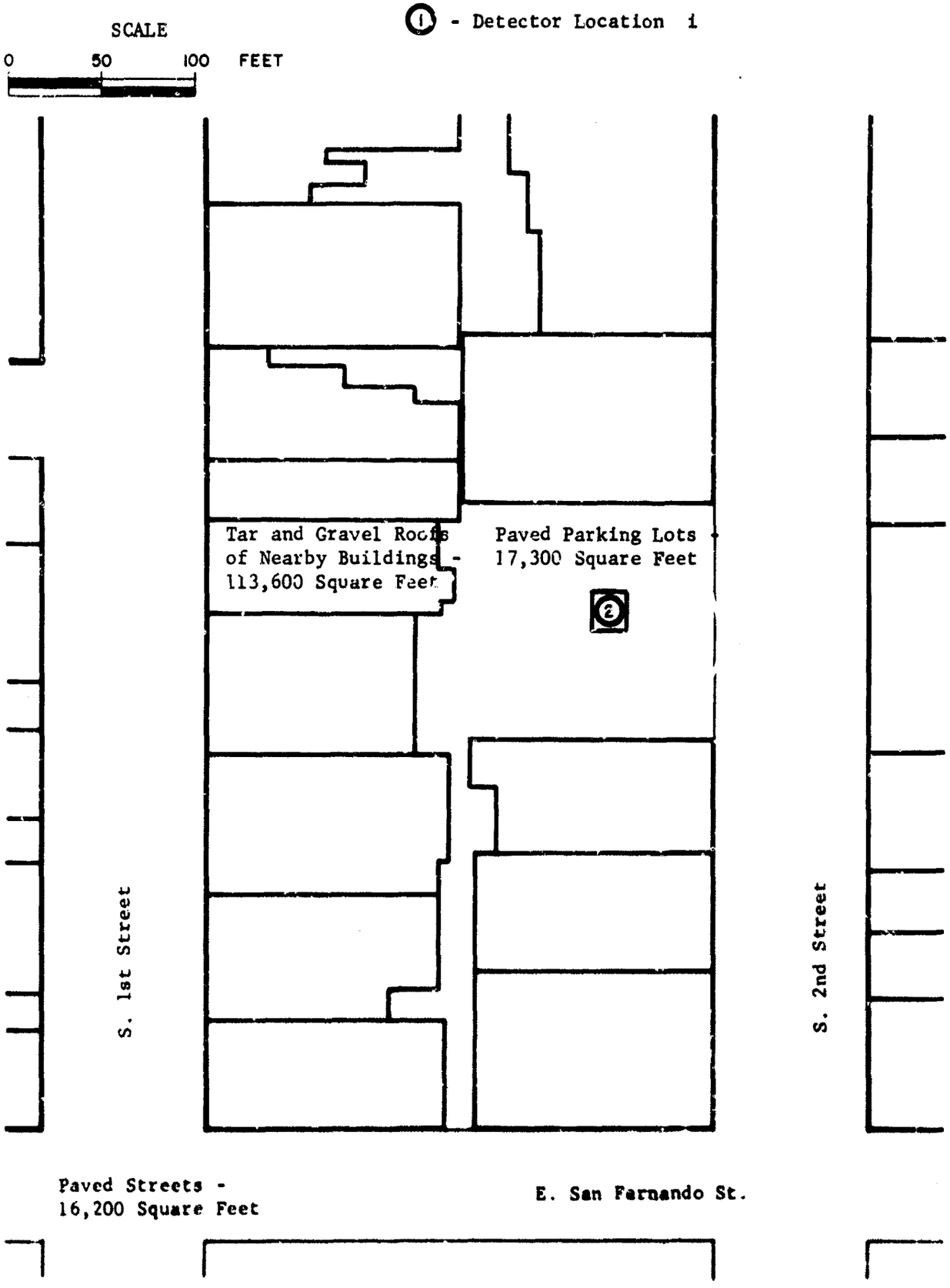


Figure 89

A Map of the Area Around a Section of the Business District Containing a Parking Lot in San Jose Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

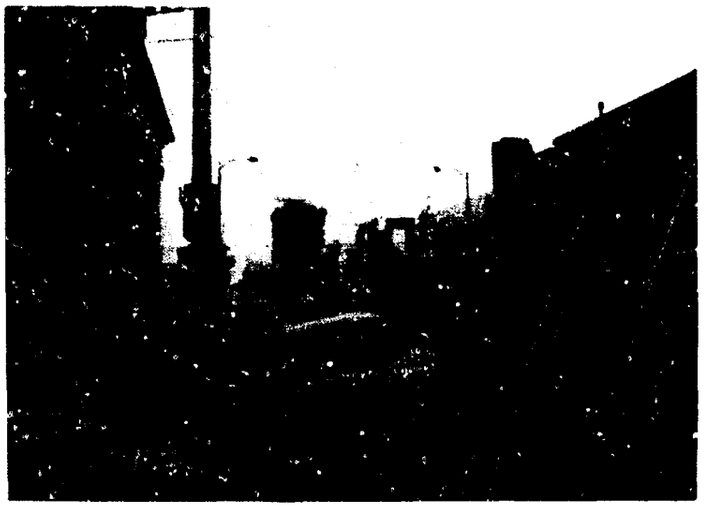


Figure 90

View 1 - Central Business District -
A View Along South First Street

Figure 91

View 2 - Central Business District -
A View Looking North on Market Street
From the Corner of South Market and West
Santa Clara Streets

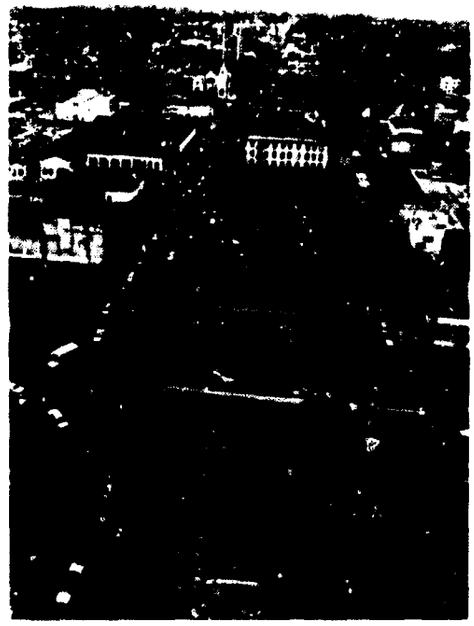


Figure 92

View 3 - Central Business District -
A View of the Intersection of
2nd Street and Santa Clara

Figure 93

View 4 - Central Business District -
A View Looking Down S. 1st Street

Figure 94

View 5 - Central Business District -
A View Along S. 2nd Street

Figure 95

View 6 - Central Business District -
A View of the Intersection of W
Santa Clara and Market Streets

Figure 96

View 7 - Central Business District -
A View of the Intersection of
1st Street and Santa Clara

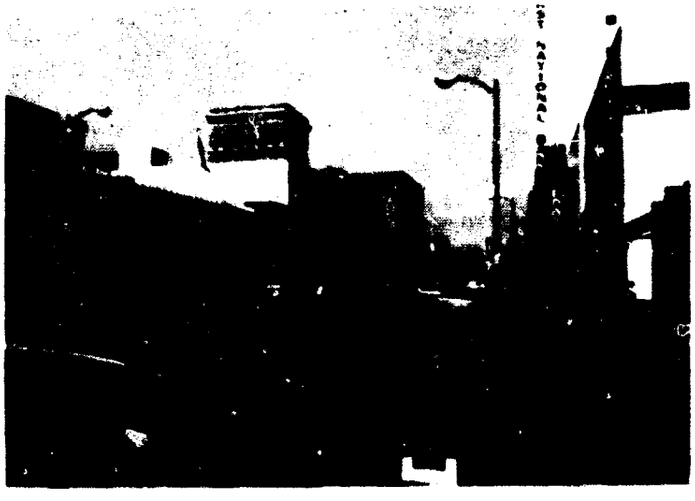


Figure 97

View 8 - Central Business District -
A View Looking East Along W.
Santa Clara Street

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table LXVII defines the three activity patterns.

Table LXVII

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j in THE CENTRAL BUSINESS DISTRICT

Activity Pattern A_i	Detector Location j		
	1 Intersection	2 Parking Lot	3 Shelter Area
A_1	.50	.00	.50
A_2	.33	.00	.67
A_3	.00	.20	.80

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 88)

Detector Location	Original PF
1 Intersection	1.7
2 Parking Lot	1.9
3 Shelter Area	100

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table LXVII)	Equivalent PF
A_1	3.3
A_2	4.8
A_3	8.6

D. Contaminated Planes

1. Intersection

Identification Number	Description	Area Size (ft^2)	Surface Material
1B	Roofs of Other Bldgs.	216,700	Tar & Gravel
2	Parking Lots	None	-------
3	Streets	164,800	Asphalt
4	Lawns, Bare Earth, Fields, etc.	None	-------

2. Parking Lot

Identification Number	Description	Area Size (ft^2)	Surface Material
1B	Roofs of Other Bldgs.	113,600	Tar & Gravel
2	Parking Lots	17,300	Asphalt
3	Streets	16,200	Asphalt
4	Lawns, Bare Earth, Fields, etc.	None	------

E. Contribution to Intensity Factors (C_{ij} Values)

Because the existance of a shelter area is assumed and the other two detector locations are outdoors, there were no building structural characteristics to be considered.

Table LXVIII lists the contribution to intensity factors for the various planes to the selected detector locations.

Table LXVIII

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES)
FOR CENTRAL BUSINESS DISTRICT

Contaminated Plane i	Detector Location j		
	1 Intersection	2 Parking Lot	3 Shelter Area
1B Roofs of Other Buildings	.0000	.0000	.0100
2 Parking Lots	.0000	.5168	.0000
3 Streets	.6059	.0226	.0000
4 Grass & Ground	.0000	.0000	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table LXIX below.

Table LXIX

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
FOR CENTRAL BUSINESS DISTRICT

Contaminated Plane i	Detector Location j		
	1 Intersection	2 Parking Lot	3 Shelter Area
1B Roofs of Other Buildings	.00	.00	1.00
2 Parking Lots	.00	.96	.00
3 Streets	1.00	.04	.00
4 Grass & Ground	.00	.00	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table. It was necessary to consider the intersection and parking lot separately because they are in two widely separated activity areas.

Table LXX

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR A CENTRAL BUSINESS DISTRICT

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Detector 1 - Intersection					
Firehosing	A	Streets (3)	.03	1.7	5
Street Sweeper	B	Streets (3)	.06	3.3	1
Vacumized Sweeper	C	Streets (3)	.09	3.3	1
Detector 2 - Parking Lot					
Firehosing	D	Streets (3)	.03	0.2	5
Firehosing	E	Paved Parking (2)	.03	0.2	5
Street Sweeper	F	Streets (3)	.06	0.3	1
Street Sweeper	G	Paved Parking (2)	.06	0.4	1

H. RN_j Values

The fraction of intensity remaining for selected strategies is given in Table LXXI below.

Table LXXI

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR CENTRAL BUSINESS DISTRICT

Combined Strategy	Detector Location j		
	1 Intersection	2 Parking Lot	3 Shelter Area
A	.03		1.00
B	.06		1.00
C	.09		1.00
D		.96	1.00
E		.07	1.00
F		.96	1.00
G		.10	1.00
D+E		.03	1.00
F+G		.06	1.00

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table LXXII.

Table LXXII

ACTIVITY REDUCTION (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR CENTRAL BUSINESS DISTRICT

Combined Strategy	Activity Pattern		
	A_1	A_2	A_3
A	.05	.06	
B	.08	.09	
C	.10	.12	
D			.96
E			.13
F			.96
G			.16
D+E			.10
F+G			.12

J. Conclusions

At detector location 1 (intersection) the only contributing plane of contamination is the street. Table LXXI shows that the radiation intensity can be reduced to 3% of its original value by A (firehosing the streets), 6% of its original value by B (street sweeping the streets), or 9% of its original value by C (vacuumized sweeping the streets). The method of decontamination would depend upon the manpower and equipment available for performing the work.

At detector location 2 (parking lot) the paved parking contributes 96% of the relative intensity to the detector. Table LXXI shows the radiation intensity can be reduced to 7% of its original value by E (firehosing the parking lot) or 10% of its original value by G (street sweeping the parking lot). Again, the method of decontamination would depend upon the manpower and equipment available.

None of the methods of decontamination considered would reduce the radiation to the shelter area because the roof of the building containing the shelter is the only contributing plane of contamination. However, for any of the activity patterns considered the radiation is reduced to a maximum of 12% of its original value by the methods considered.

XIV. DECONTAMINATION ANALYSIS OF SAN JOSE CITY HALL

A. Discussion

San Jose City Hall is one of the complex of many city office buildings and other facilities. It is surrounded immediately by large areas for parking and open lawns.

Figure 98 is a simplified diagram of the building, showing the locations of detectors and indicating the locations, sizes, and surface materials of some of the contributing planes of contamination to the activity area. It also shows the three distinct wings into which the building is divided. Figures 99 through 104 are a number of photographs taken around the City Hall area, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 105 is a map indicating the locations and directions of the photographs.

B. Definition of Activities

Four different activity patterns are considered in this analysis. Four detector locations are used to characterize the activity patterns. These detector locations are as follows:

Detector Location	Description
1	City Council Chambers
2	Mayor's Office
3	Public Works Department
4	Basement Shelter Area

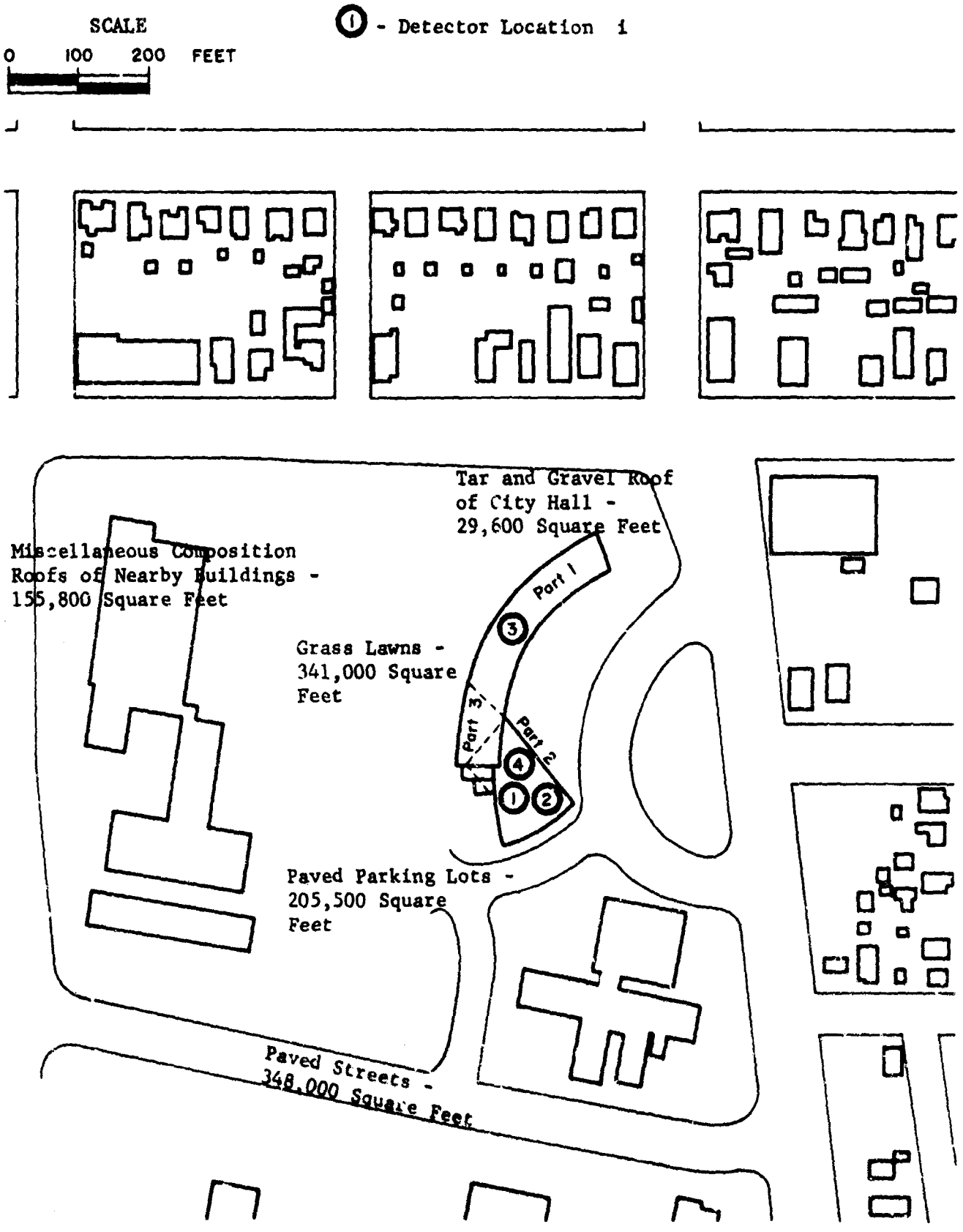


Figure 98

A Map of the Area Around San Jose City Hall Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

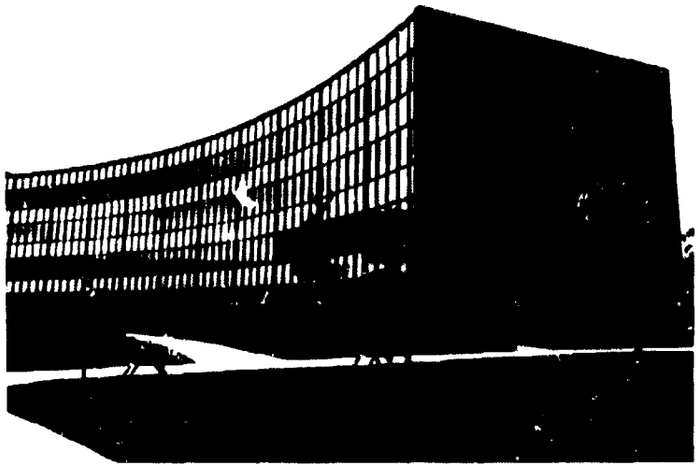


Figure 99

View 1 - San Jose City Hall -
A View of the End and Part
of the Front of the Building

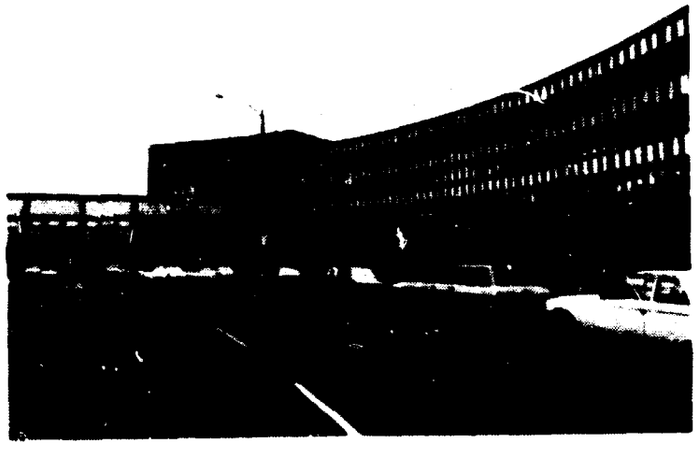


Figure 100

View 2 - San Jose City Hall -
Another View of the Front
of the Building

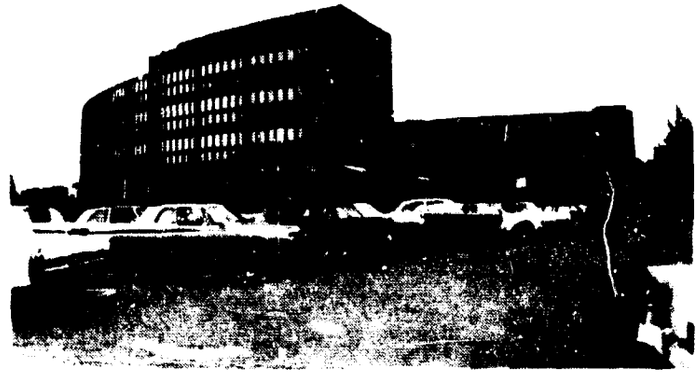


Figure 101

View 3 - San Jose City Hall -
A View Showing Part of the Back
and Part of the Front of the Building

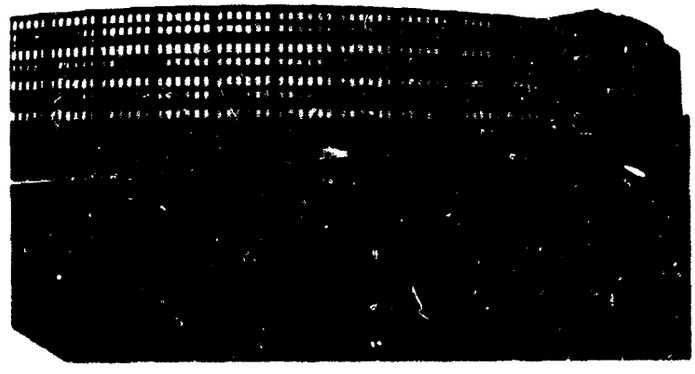


Figure 102

View 4 - San Jose City Hall -
A View Showing the Back of
City Hall and the Lawn

Figure 103

View 5 - San Jose City Hall -
A View Showing the Front
Entrance to the City Hall

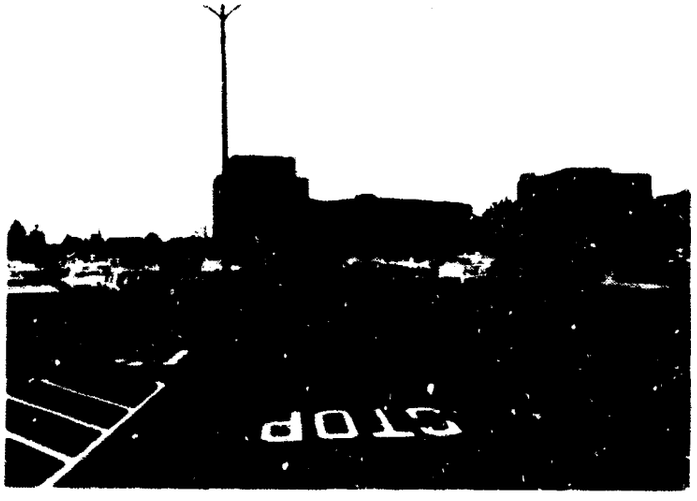


Figure 104

View 6 - San Jose City Hall -
A View Showing the Parking Area
and Road Leading to the Side of
the City Hall

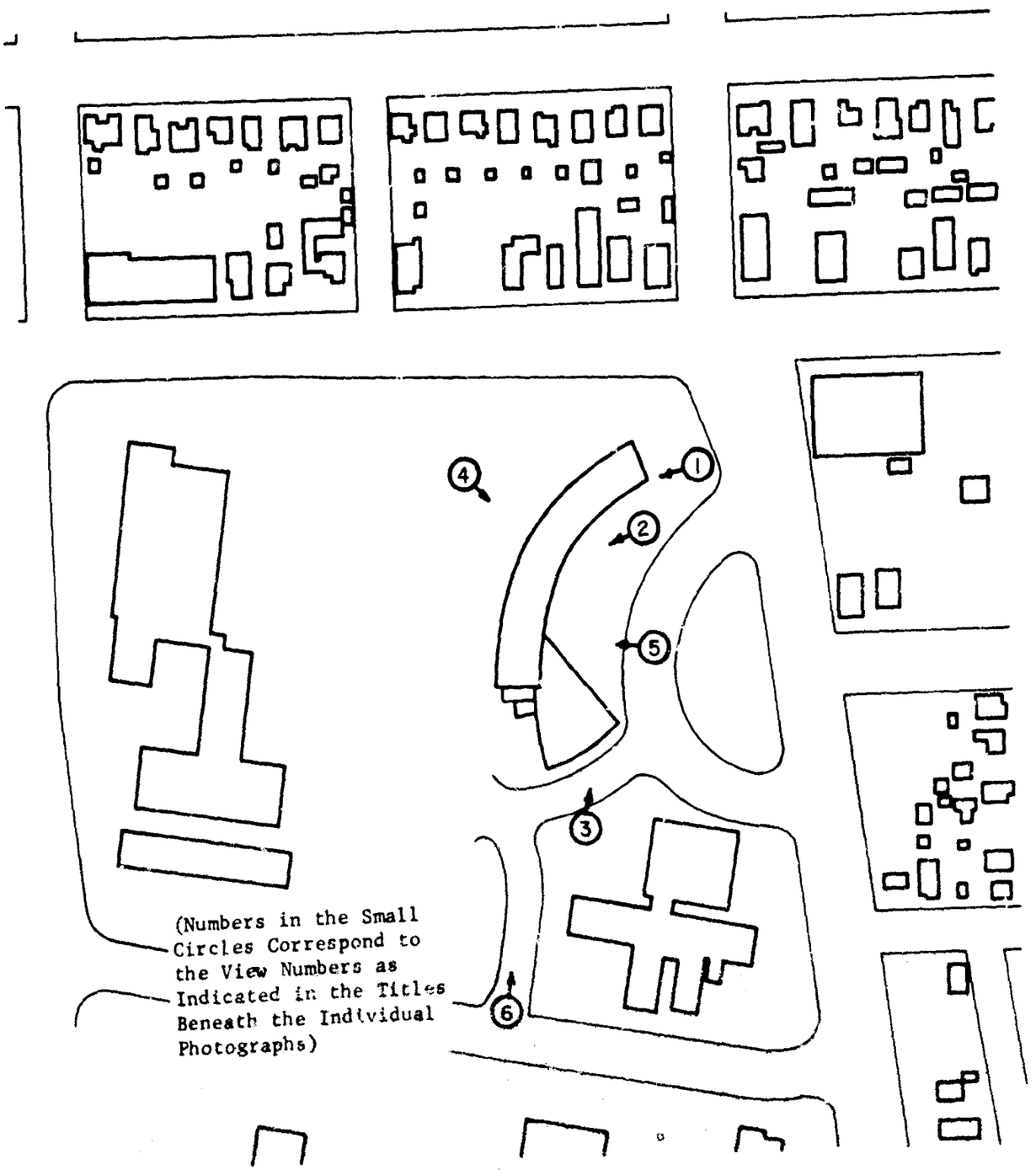


Figure 105

A Map of the Area Around San Jose City Hall Showing the Locations and Directions of the Photographs Shown in Figures 99 through 104

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table LXXIII defines the four activity patterns.

Table LXXIII

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN SAN JOSE CITY HALL

Activity Pattern A_i	Detector Location j			
	1 City Council Chamber	2 Mayor's Office	3 Public Works Department	4 Basement Shelter Area
A_1	.20	.10	.00	.70
A_2	.40	.00	.00	.60
A_3	.00	.35	.00	.65
A_4	.00	.00	.33	.67

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 98)

Detector Location	Original PF
1 City Council Chambers	13
2 Mayor's Office	6.6
3 Public Works Department	5.7
4 Basement Shelter Area	1666

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table LXXIII)	Equivalent PF
A_1	33
A_2	33
A_3	19
A_4	17

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of City Hall	29,600	Tar & Gravel
1B	Other Roofs	155,800	Miscellaneous*
2	Paved Parking	205,500	Asphalt
3	Streets	348,000	Asphalt
4	Lawns, Bare Earth, Fields, etc.	341,000	Grass

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contributuon to intensity values:

1. Part 1

   a. Exterior Walls

      (1) Walls on north and south sides - ½" glass (7 lb/ft^2)

      (2) Wall on west side - glass and brick (33 lb/ft^2)

      (3) Wall on east side - 12" brick (108 lb/ft^2)

   b. Floors - 7" reinforced concrete (88 lb/ft^2)

   c. Roof - 5" reinforced concrete (63 lb/ft^2)

   d. Interior walls - 3/4" plywood sheathing (2 lb/ft^2)

2. Part 2

   a. Exterior Walls

      (1) Wall on east side - glass and brick (30 lb/ft^2)

      (2) Walls on south and west sides - 10" brick (100 lb/ft^2)

      (3) Wall on north side - included in section 1 of the building (0 lb/ft^2)

   b. Floors - 7" reinforced concrete (88 lb/ft^2)

   c. Roof - 5" reinforced concrete (63 lb/ft^2)

   d. Interior walls - 3/4" plywood sheathing (2 lb/ft^2)

* Considered tar and gravel for decontamination purposes.

3. Part 3

a. Exterior Walls

(1) Walls on north and south side - glass and brick (115 lb/ft^2)

(2) Walls on east and west side - 12" brick (108 lb/ft^2)

b. Floors - 7" reinforced concrete (88 lb/ft^2)

c. Roof - 5" reinforced concrete (63 lb/ft^2)

d. Interior partition - no partitions considered.

Table LXXIV lists the contribution to intensity factors of the various planes to the selected detector locations.

Table LXXIV

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES)
FOR SAN JOSE CITY HALL

Contaminated Plane i	Detector Location j			
	1 City Council Chamber	2 Mayor's Office	3 Public Works Department	4 Basement Shelter Area
1A Roof of City Hall	.0531	.0036	.0000	.0006
1B Other Roofs	.0028	.0000	.0000	.0000
2 Paved Parking	.0033	.0084	.0103	.0000
3 Streets	.0059	.0277	.0159	.0000
4 Grass & Ground	.0092	.1130	.1491	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table LXXV below.

Table LXXV

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES) FOR SAN JOSE CITY HALL

Contaminated Plane i	Detector Location j			
	1 City Council Chamber	2 Mayor's Office	3 Public Works Department	4 Basement Shelter Area
1A Roof of City Hall	.71	.02	.00	1.00
1B Other Roofs	.04	.00	.00	.00
2 Paved Parking	.04	.06	.06	.00
3 Streets	.08	.18	.09	.00
4 Grass & Ground	.12	.74	.85	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table LXXVI

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR SAN JOSE CITY HALL

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof (1A)	.03	2.3	7
Firehosing	B	Other Roofs (1B)	.03	11.1	7
Firehosing	C	Paved Parking (2)	.03	2.2	5
Firehosing	D	Streets (3)	.03	2.4	5
Street Sweeper	E	Paved Parking (2)	.06	4.4	1
Street Sweeper	F	Streets (3)	.06	4.7	1
Grading	G	Ground (4)	.1	85.8	1

H. RN_j Values

The fraction of intensity remaining (RN_j Values) for selected strategies of decontamination are given in Table LXXVII below.

Table LXXVII

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR SAN JOSE CITY HALL

Combined Strategy	Detector Location j			
	1 City Council Chamber	2 Mayor's Office	3 Public Works Department	4 Basement Shelter Area
A	.31	.98	1.00	.03
C	.96	.95	.94	1.00
D	.92	.82	.91	1.00
E	.96	.95	.94	1.00
F	.93	.83	.91	1.00
G	.89	.33	.23	1.00
A+B	.27	.98	1.00	.03
A+B+C+D	.15	.75	.86	.03
A+B+E+F	.15	.75	.86	.03
A+B+E+F+G	.04	.09	.09	.03

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table LXXVIII.

Table LXXVIII

ACTIVITY REDUCTION (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR SAN JOSE CITY HALL

Combined Strategy	Activity Pattern			
	A_1	A_2	A_3	A_4
A	.64	.30	.97	.99
C	.95	.96	.95	.94
D	.87	.92	.83	.91
E	.95	.96	.95	.95
F	.88	.93	.83	.92
G	.61	.89	.34	.24
A+B	.62	.27	.97	.99
A+B+C+D	.45	.15	.74	.85
A+B+E+F	.45	.15	.75	.85
A+B+E+F+G	.07	.04	.09	.09

J. Conclusions

Tables LXXVII and LXXVIII indicate that a combined strategy of A (firehosing the roof of the City Hall), B (firehosing the roofs of other buildings), E (street sweeping the parking lots), F (street sweeping the streets), and G (grading the surrounding ground) will reduce the radiation at any detector location or for any activity pattern to a maximum of 9% of its original value. Strategy B is an unnecessary part of the decontamination process, however, because Table LXXVII shows a combined strategy of A+B is of about the same value as strategy A along.

The most time consuming part of the decontamination is strategy G, which requires one man to grade ground for 85.80 hours.

Attention is brought to the fact that firehosing the parking lots and streets at a mass reduction factor level of .06 is, for practical purposes, as effective as using a level of .03, and it is less time consuming. This is true because the streets and paved parking offer a relatively small amount of the total radiation to the detector locations.

XV. DECONTAMINATION ANALYSIS OF VALLEY FAIR SHOPPING CENTER

A. Discussion

Valley Fair Shopping Center is located in an open area to the northwest of the intersection of Stevens Creek Road and a large freeway.

The shopping center consists of very closely knit structures, so that the whole complex, in effect, may be considered as one. Figure 106 is a simplified diagram of the shopping center, showing the locations of detectors, and indicating the locations, sizes, and surface materials of the contributing planes of contamination to the activity areas. Figures 107 through 114 are a number of photographs taken around the shopping center, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 115 is a map showing the locations and directions of the photographs.

B. Definition of Activities

Five different activity patterns are considered in this analysis. Three detector locations are used to determine these activity patterns. These detector locations are as follows:

Detector Location	Description
1	Tunnel Area
2	Parking Lot #1
3	Parking Lot #2

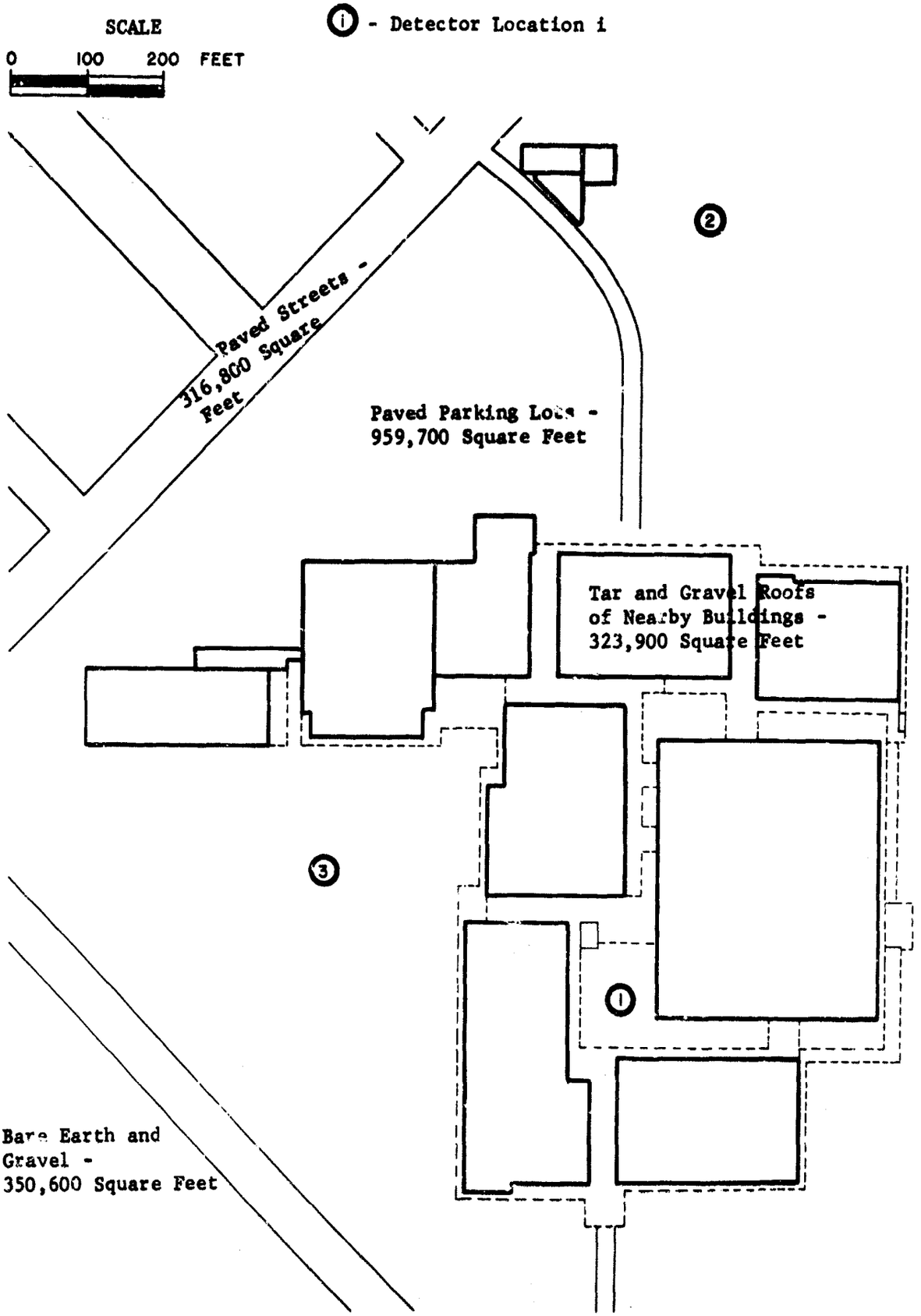


Figure 106

A Map of the Area Around Valley Fair Shopping Center Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

Figure 107

View 1 - Valley Fair Shopping Center -
A View of One of the Parking Areas

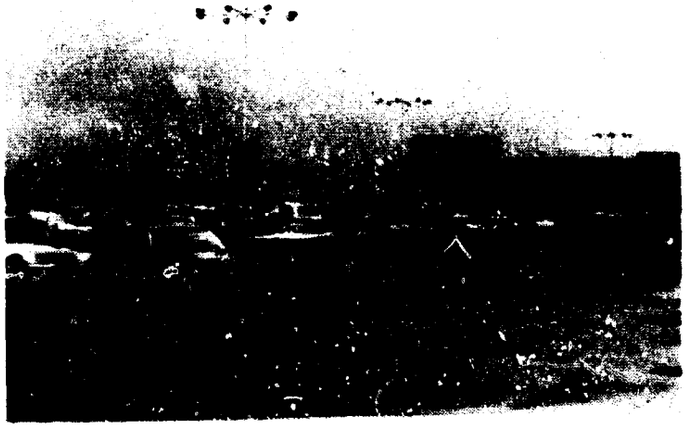


Figure 108

View 2 - Valley Fair Shopping Center -
A View of Another Parking Area

Figure 109

View 3 - Valley Fair Shopping Center - A View of Part of the Roof of the Shopping Center and the Surrounding Area

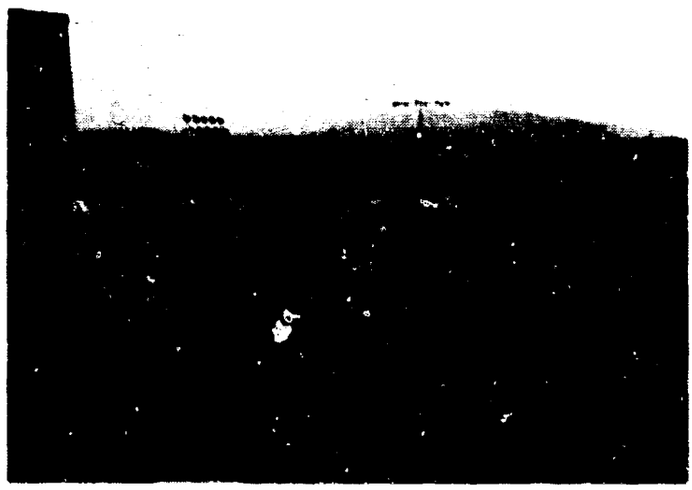


Figure 110

View 4 - Valley Fair Shopping Center - Another View of the Roof of the Shopping Center and the Surrounding Area

Figure 111

View 5 - Valley Fair Shopping Center -
A View from the Roof of Part of
the Parking Area

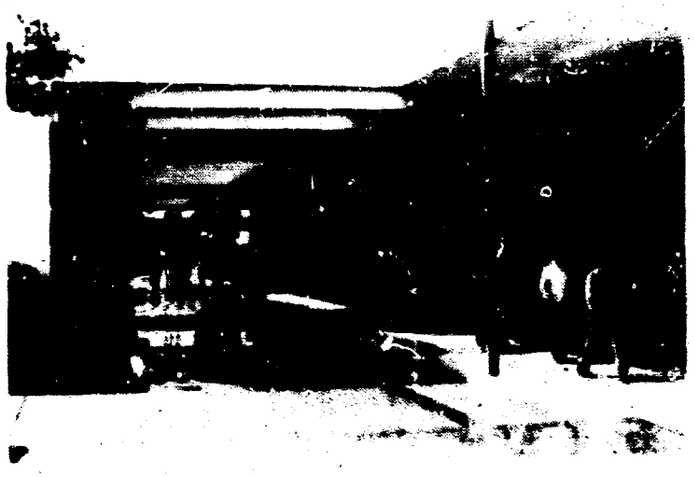


Figure 112

View 6 - Valley Fair Shopping Center -
A View of a Typical Covered
Walkway in the Shopping Center

Figure 113

View 7 - Valley Fair Shopping Center -
A View of an Open Court in
the Shopping Center

Figure 11

View 8 - Valley Fair Shopping Center -
A View of an Open Walkway in
the Shopping Center

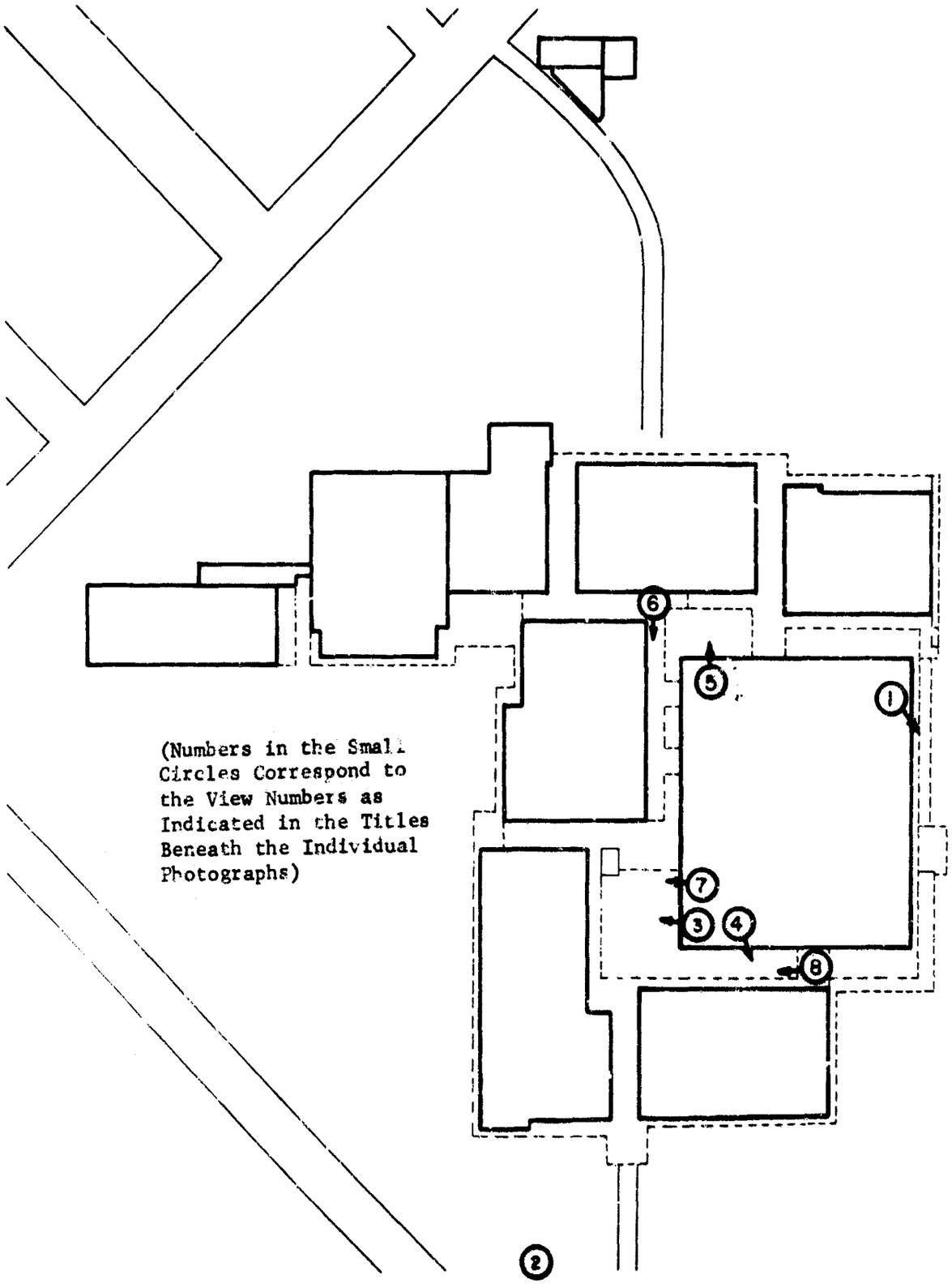


Figure 115

A Map of the Area Around Valley Fair Shopping Center Showing the Locations and Directions of the Photographs Shown in Figures 107 through 114

These activities are described entirely according to the amount of time that an activity pattern requires a person to spend to each of the detector locations. Thus, Table LXXIX defines the five activity patterns.

Table LXXIX

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i
TO BE SPENT AT DETECTOR LOCATION j
IN VALLEY FAIR SHOPPING CENTER

Activity Pattern A_i	Detector Location j		
	1 Tunnel Area	2 Parking Lot #1	3 Parking Lot #2
A_1	.60	.40	.00
A_2	1.00	.00	.00
A_3	.70	.30	.00
A_4	.65	.00	.35
A_5	.70	.00	.30

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 106)

Detector Location	Original PF
1 Tunnel Area	10,000
2 Parking Lot #1	2.2
3 Parking Lot #2	2.5

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table LXXIX)	Equivalent PF
A_1	5.5
A_2	10,000
A_3	7.3
A_4	7.1
A_5	8.3

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1B	Other Roofs	323,900	Tar and Gravel
2	Paved Parking	959,700	Asphalt
3	Streets	316,800	Asphalt
4	Lawns, Bare Earth, Fields, etc.	350,600	Bare Earth and Gravel

E. Contribution to Intensity Factors

The following gives the structural characteristics of the tunnel area which were required to calculate the contribution to intensity values. (Because the detectors are outdoors at detector locations 2 and 3, there are no structural characteristics.)

Tunnel Area

a. Exterior walls - infinite ground

b. Roof - 6" reinforced concrete (75 lbs/ft^2).

Table LXXX lists the contribution to intensity factors of the various planes to the selected detector locations.

Table LXXX

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES) FOR VALLEY FAIR SHOPPING CENTER

Contaminated Plane i	Detector Location j		
	1 Tunnel Area	2 Parking Lot #1	3 Parking Lot #2
1A Roof of Tunnel	.0001	.0000	.0000
1B Other Roofs	.0000	.0000	.0000
2 Parking Lots	.0000	.4347	.3642
3 Streets	.0000	.0086	.0064
4 Grass & Ground	.0000	.0117	.0328

F. Relative Intensity Contributions

The relative intensity contributions are given in Table LXXXI below.

Table LXXXI

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES)
FOR VALLEY FAIR SHOPPING CENTER

Contaminated Plane i	Detector Location j		
	1 Tunnel Area	2 Parking Lot #1	3 Parking Lot #2
1A Roof of Bldg.	1.00	.00	.00
1B Other Roofs	.00	.00	.00
2 Parking Lots	.00	.96	.90
3 Streets	.00	.02	.02
4 Grass & Ground	.00	.03	.08

G. Cost and Effectiveness

The cost and effectiveness data for selected method of decontaminating surfaces are given in the following table.

Table LXXXII

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS
OF DECONTAMINATING SURFACES FOR VALLEY FAIR
SHOPPING CENTER

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Street Sweeper	A	Paved Parking (2)	.06	19.2	1
Firehosing	B	Paved Parking (2)	.03	9.6	5
Street Sweeper	C	Streets (3)	.06	6.4	1
Firehosing	D	Streets (3)	.03	3.2	5
Grading	E	Ground (4)	.10	84.0	1

H. RN_j Values

The fraction of intensity remaining for selected strategies of decontamination is given in Table LXXXIII below.

Table LXXXIII

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR VALLEY FAIR SHOPPING CENTER

Combined Strategy	Detector Location j		
	1 Tunnel Area	2 Parking Lot #1	3 Parking Lot #2
A	1.00	.10	.15
B	1.00	.07	.12
C	1.00	.98	.99
D	1.00	.98	.98
E	1.00	.98	.93
A+C	1.00	.08	.14
B+D	1.00	.05	.11
A+C+E	1.00	.06	.06
B+D+E	1.00	.03	.04

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table LXXXIV.

Table LXXXIV

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR VALLEY FAIR SHOPPING CENTER

Combined Strategy	Activity Pattern				
	A_1	A_2	A_3	A_4	A_5
A	.10	1.00	.10	.15	.15
B	.07	1.00	.07	.12	.12
C	.98	1.00	.98	.99	.99
D	.98	1.00	.98	.98	.98
E	.98	1.00	.98	.93	.93
A+C	.08	1.00	.08	.14	.14
B+D	.06	1.00	.06	.11	.11
A+C+E	.06	1.00	.06	.06	.06
B+D+E	.03	1.00	.03	.04	.04

J. Conclusions

No methods of decontamination were considered for the tunnel area, which could serve as a shelter area, because it has a calculated PF of 10,000.

The radiation at the two detector locations in the parking lots could be reduced to 10% of its original value by strategy A (street sweeping the paved parking) or 7% of its original value by B (firehosing the paved parking). Method A requires one man to work 19.2 hours while method B requires a team of five men to work 9.2 hours.

If it is felt necessary, a further slight reduction in radiation can be achieved by C (street sweeping the streets) or D (firehosing the streets). This is probably not worth the time and effort that would be expended.

XVI. DECONTAMINATION ANALYSIS OF SAN JOSE HOSPITAL

A. Discussion

San Jose Hospital is a large facility surrounded by parking lots, doctor's offices, and homes. It occupies an entire city block.

Figure 116 is a simplified diagram of the building, showing the locations of detectors and indicating the locations, sizes, and surface materials of the contributing planes of contamination to the activity area. It also shows the four wings into which the building is divided. Figures 117 through 124 are a number of photographs taken around the hospital area, showing some of the contaminated planes and other features of the area that would influence decontamination. Figure 125 is a map indicating the locations and directions of the photographs.

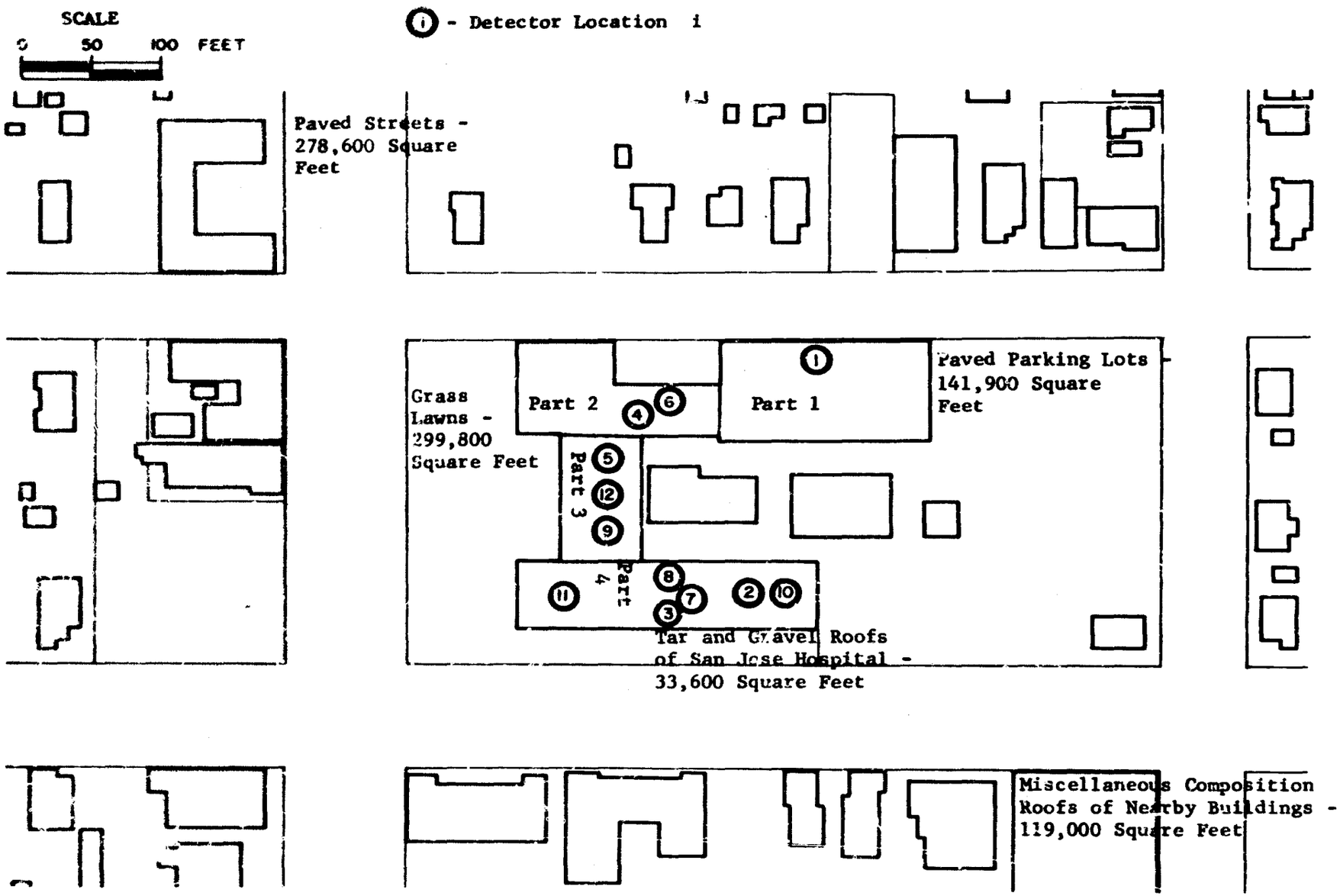


Figure 116

A Map of the Area Around San Jose Hospital Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

Figure 117

View 1 - San Jose Hospital -
A View Showing the Rear
of the Hospital

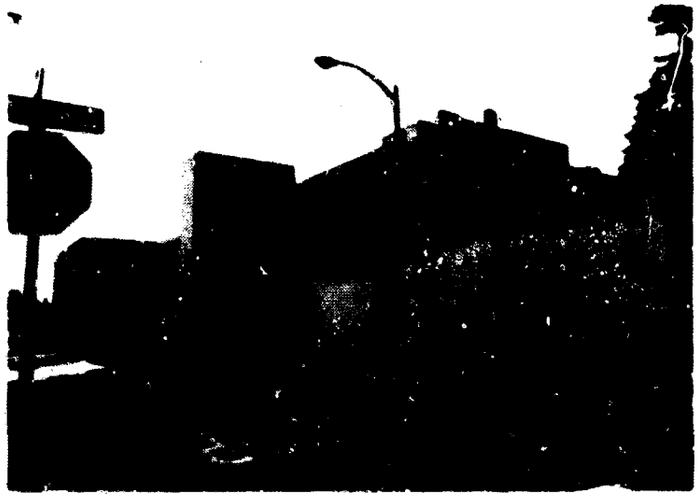


Figure 118

View 2 - San Jose Hospital -
A View of the Side of the
Hospital Facing N. 14th Street

Figure 119

View 3 - San Jose Hospital -
A View Showing the Front
Entrance to the Hospital

Figure 120

View 4 - San Jose Hospital -
A Partial View of the Interior
Court of the Hospital

Figure 121

View 5 - San Jose Hospital -
A View Along N. 15th Street

Figure 122

View 6 - San Jose Hospital -
A View from the Top of the
Hospital Showing the Surrounding Area

Figure 123

View 7 - San Jose Hospital -
A View of the Hospital Roof

Figure 124

View 8 - San Jose Hospital -
A View of the Hospital
Parking Lot

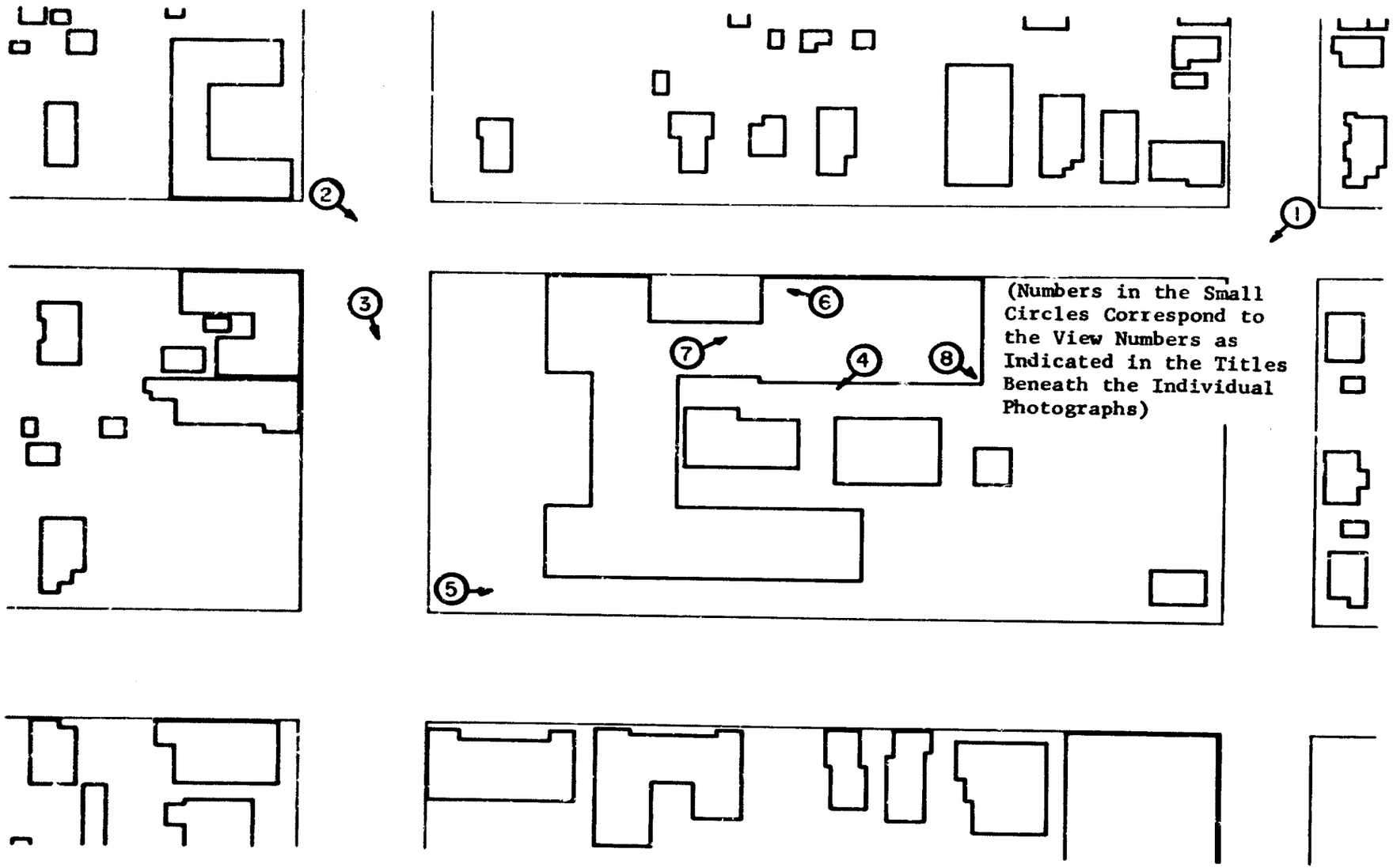


Figure 125

A Map of the Area Around San Jose Hospital Showing the Locations and Directions of the Photographs Shown in Figures 117 through 124

B. Definition of Activities

Eleven different activity patterns are considered in this analysis. Twelve detector locations are used to characterize the activity patterns. These detector locations are as follows:

Detector Locations	Description
1	Operating Room (Ground Floor)
2	Central Medical Supply Area (Ground Floor)
3	Kitchen (Ground Floor)
4	Patient Room (1st Floor)
5	Admitting Office (1st Floor)
6	Nurse's Station (1st Floor)
7	Patient Room (2nd Floor)
8	Nurse's Station (2nd Floor)
9	Patient Room (3rd Floor)
10	Operating Room (3rd Floor)
11	Nursery (3rd Floor)
12	Shelter Area (Basement)

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table LXXXV defines the eleven activity patterns.

Table LXXXV

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN SAN JOSE HOSPITAL

Activity Pattern A_i	Detector Location j											
	1 Operating Room (G.F.)	2 Central Medical Supply Area (G.F.)	3 Kitchen (G.F.)	4 Patient Room (1st Fl.)	5 Admitting Office (1st Fl.)	6 Nurse's Station (1st Fl.)	7 Patient Room (2nd Fl.)	8 Nurse's Station (2nd Fl.)	9 Patient Room (3rd Fl.)	10 Operating Room (3rd Fl.)	11 Nursery (3rd Fl.)	12 Shelter Area (Basement)
A_1	.25	.00	.00	.10	.00	.00	.00	.00	.00	.00	.00	.65
A_2	.00	.40	.00	.00	.00	.00	.00	.00	.00	.00	.00	.60
A_3	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.00	.00
A_4	.00	.00	.33	.00	.00	.00	.00	.00	.00	.00	.00	.67
A_5	.00	.00	.00	.00	.00	.00	.00	.15	.10	.10	.00	.65
A_6	.00	.00	.00	1.00	.00	.00	.00	.00	.00	.00	.00	.00
A_7	.00	.00	.00	.00	.33	.00	.00	.00	.00	.00	.00	.67
A_8	.00	.05	.00	.10	.00	.05	.00	.00	.00	.00	.00	.80
A_9	.00	.00	.00	.00	.00	.00	.00	.00	.05	.20	.10	.65
A_{10}	.00	.07	.00	.00	.00	.00	.20	.05	.00	.00	.00	.68
A_{11}	.10	.00	.00	.10	.00	.15	.00	.00	.00	.00	.00	.65

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 116)

Detector Location		Original PF
1	Operating Room (Ground Floor)	40
2	Central Medical Supply Area (Ground Floor)	250
3	Kitchen (Ground Floor)	357
4	Patient Room (1st Floor)	141
5	Admitting Office (1st Floor)	23
6	Nurse's Station (1st Floor)	24
7	Patient Room (2nd Floor)	79
8	Nurse's Station (2nd Floor)	42
9	Patient Room (3rd Floor)	69
10	Operating Room (3rd Floor)	12
11	Nursery (3rd Floor)	11
12	Shelter Area (Basement)	92

2. Equivalent Protection Factors for Activity Patterns

Activity Pattern (See Table LXXXV)	Equivalent PF
A_1	71
A_2	123
A_3	11
A_4	122
A_5	49
A_6	141
A_7	47
A_8	85
A_9	30
A_{10}	88
A_{11}	60

D Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1A	Roof of Hospital	33,600	Tar & Gravel
1B	Other Roofs	119,000	Miscellaneous*
2	Paved Parking	141,900	Asphalt
3	Streets	278,600	Asphalt
4	Lawns, Bare Earth, Fields, etc.	299,800	Grass

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the building which were required to calculate the contribution to intensity values:

1. Part 1

   a Exterior walls - 8" cinder block (72 lb/ft^2)

   b. Floors - cellular steel deck and finishing (45 lb/ft^2)

   c. Roof - cellular steel deck and finishing (50 lb/ft^2)

   d. Interior partitions - 1" plaster on lath (10 lb/ft^2)

2. Part 2

   a. Exterior walls - 6" concrete block (48 lb/ft^2)

   b. Floors - cellular steel deck and finishing (45 lb/ft^2)

   c. Roof - cellular steel deck and finishing (50 lb/ft^2)

   d. Interior partitions - 6" concrete block (48 lb/ft^2)

3. Part 3

   a. Exterior walls - 6" concrete block (48 lb/ft^2)

   b. Floors - 4" reinforced concrete slab and finishing (60 lb/ft^2)

   c. Roof - asphalt covering on wooden planks (10 lb/ft^2)

   d. Interior partitions - 6" concrete block (48 lb/ft^2)

* Assumed tar and gravel for decontamination purposes.

4. Part 4

a. Exterior walls - 8" cinder block (72 lb/ft^2)

b. Floors - cellular steel deck and finishing (45 lb/ft^2)

c. Roof - cellular steel deck and finishing and tar and gravel (50 lb/ft^2)

Table LXXXVI lists the contribution to intensity factors of the various planes to the selected detector locations.

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions are given in Table LXXXVII.

Table LXXXVI

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES) FOR SAN JOSE HOSPITAL

Contaminated Plane i	Detector Location j											
	1 Operating Room (G. F.)	2 Central Medical Supply Area (G.F.)	3 Kitchen (G.F.)	4 Patient Room (1st Fl.)	5 Admitting Office (1st Fl.)	6 Nurse's Station (1st Fl.)	7 Patient Room (2nd Fl.)	8 Nurse's Station (2nd Fl.)	9 Patient Room (3rd Fl.)	10 Operating Room (3rd Fl.)	11 Nursery (3rd Fl.)	12 Shelter Area (Basement)
1A Roof of Hospital	.0120	.0012	.0012	.0014	.0410	.0018	.0080	.0126	.0090	.0767	.0767	.0090
1B Other Roofs	.0000	.0000	.0000	.0020	.0009	.0108	.0028	.0061	.0036	.0013	.0013	.0000
2 Paved Parking	.0028	.0013	.0004	.0003	.0000	.0017	.0003	.0011	.0005	.0020	.0019	.0000
3 Streets	.0092	.0015	0012	.0014	.0006	.0096	.0016	.0038	.0013	.0016	.0039	.0017
4 Grass & Ground	.0011	.0000	.0000	.0020	.0001	.0185	.0000	.0001	.0000	.0001	.0032	.0002

Table LXXXVII

RELATIVE INTENSITY CONTRIBUTION (CF_{ij} VALUES) FOR SAN JOSE HOSPITAL

Contaminated Plane i	Operating Room (G.F.)	Central Medical Supply Area (G.F.)	Kitchen (G.F.)	Patient Room (1st Fl.)	Admitting Office (1st Fl.)	Nurse's Station (1st Fl.)	Patient Room (2nd Fl.)	Nurse's Station (2nd Fl.)	Patient Room (3rd Fl.)	Operating Room (3rd Fl.)	Nursery (3rd Fl.)	Shelter Area (Basement)
1A Roof of Hospital	.48	.30	.43	.20	.96	.04	.63	.53	.62	.94	.88	.83
1B Other Roofs	.00	.00	.00	.28	.02	.25	.22	.26	.25	.02	.01	.00
2 Paved Parking	.11	.32	.14	.04	.00	.04	.02	.05	.03	.02	.02	.00
3 Streets	.37	.37	.43	.20	.01	.23	.13	.16	.09	.02	.04	.16
4 Grass & Ground	.04	.00	.00	.28	.00	.44	.00	.00	.00	.00	.04	.02

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table LXXXVIII

COST AND EFFECTIVENESS DATA FOR SELECTED METHODS OF DECONTAMINATING SURFACES FOR SAN JOSE HOSPITAL

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roof (1A)	.07	1.5	7
Firehosing	B	Paved Parking (2)	.03	1.4	5
Street Sweeper	C	Streets (3)	.06	5.6	1
Grading	D	Ground (4)	.10	72.0	1
Firehosing	E	Roof (1A)	.03	2.4	7
Firehosing	F	Roofs (1B)	.07	5.2	7

H. RN_j Values

The fraction of intensity remaining for selected strategies of decontamination is given in Table LXXXIX.

Table LXXXIX

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR SAN JOSE HOSPITAL

Combined Strategy	Detector Location j											
	1 Operating Room (G.F.)	2 Central Medical Supply Area (G.F.)	3 Kitchen (G.F.)	4 Patient Room (1st Fl.)	5 Admitting Office (1st Fl.)	6 Nurse's Station (1st Fl.)	7 Patient Room (2nd Fl.)	8 Nurse's Station (2nd Fl.)	9 Patient Room (3rd Fl.)	10 Operating Room (3rd Fl.)	11 Nursery (3rd Fl.)	12 Shelter Area
A	.56	.72	.60	.82	.10	.96	.41	.51	.42	.13	.18	.23
B	.89	.68	.86	.96	1.00	.96	.98	.95	.97	.98	.98	1.00
C	.66	.65	.60	.81	.99	.79	.88	.85	.92	.98	.96	.85
D	.96	1.00	1.00	.75	1.00	.61	1.00	1.00	1.00	1.00	.97	.98
E	.54	.71	.58	.81	.07	.96	.39	.48	.39	.09	.14	.20
F	1.00	1.00	1.00	.74	.98	.76	.79	.76	.77	.99	.99	1.00
A+F	.56	.72	.60	.55	.09	.72	.21	.27	.19	.11	.17	.23
A+B	.49	.41	.46	.78	.10	.92	.39	.46	.39	.10	.16	.23
A+B+C	.10	.05	.06	.59	.09	.71	.27	.31	.30	.08	.12	.09
B+C+E	.08	.04	.04	.58	.05	.71	.25	.29	.28	.05	.08	.05
B+C+D+E	.04	.04	.04	.33	.05	.31	.25	.28	.28	.05	.05	.04

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table XC.

Table XC

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR SAN JOSE HOSPITAL

Combined Strategy	Activity Patterns										
	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}
A	.41	.33	.18	.27	.25	.82	.15	.41	.17	.31	.58
B	.95	.94	.98	.98	.98	.96	1.00	.99	.98	.98	.97
C	.76	.81	.96	.82	.91	.81	.94	.84	.95	.85	.80
D	.96	.99	.97	.99	.99	.75	.99	.90	.99	.99	.83
E	.38	.30	.14	.24	.22	.81	.11	.38	.13	.28	.57
F	.99	1.00	.99	1.00	.94	.74	.99	.94	.98	.93	.90
A+F	.39	.33	.17	.27	.19	.55	.14	.35	.15	.24	.48
A+B	.36	.27	.16	.26	.23	.78	.15	.39	.15	.30	.55
A+B+C	.12	.08	.12	.08	.14	.59	.09	.23	.10	.15	.35
B+C+E	.09	.05	.08	.05	.11	.58	.05	.20	.06	.12	.33
B+C+D+E	.05	.04	.05	.04	.10	.33	.05	.10	.05	.11	.16

J. Conclusions

It is interesting to observe from Table LXXXVII the differences in the relative intensity contributions to the various detectors from the contaminating planes. Because of this wide variance, none of the combined decontamination strategies considered adequately reduced the radiation at all detector locations. If strategy F (firehosing the roofs of other buildings) were added to combined strategy B (firehosing the paved parking lots), C (street sweeping the streets), D (grading the

ground), and E (firehosing the roof of the hospital) the radiation could be substantially reduced for all detectors. Table LXXXIX shows that at some of the detector locations the radiation is reduced to an acceptable level by much simplier decontamination strategies than the one discussed above.

Only activity pattern A_6 has a relatively large amount, 33%, of the original radiation remaining after decontamination by strategy B+C+D+E. This is because A_6 requires a person to spend all of his time in a patient room on the first floor which receives 28% of all radiation from the roofs of other buildings. However, the original PF of the room was calculated to be 140.85.

Although detector 12 in the basement was chosen as the shelter area, its PF of 91.74 was somewhat lower than the PF's of the central medical supply area (250.00) and the kitchen (357.14) on the ground floor.

XVII. DECONTAMINATION ANALYSIS OF THE SEWAGE TREATMENT PLANT

A. Discussion

The Sewage Treatment Plant serves San Jose as well as nearby cities such as Santa Clara, etc. Due to this fact, its functioning is important, not only to the city of San Jose, but also to the southern San Francisco Bay Area. The plant is located outside the city limits on the north side of the city.

The complex consists of widely scattered buildings in a large open area (several hundred acres). The buildings are connected with each other by underground tunnels.

Figure 126 is an aerial view of the sewage plant facility. Figure 127 is a diagram of the facility, showing the locations of detectors and indicating the locations, sizes, and surface materials of the contributing planes of contamination to the activity area. The diagram also indicates the names of the various buildings. Figures 128 through 133 are a number of photographs taken in and around the facility, showing some of the contaminated planes and other features that would influence decontamination. Figure 134 is a map showing the locations and directions of the photographs.

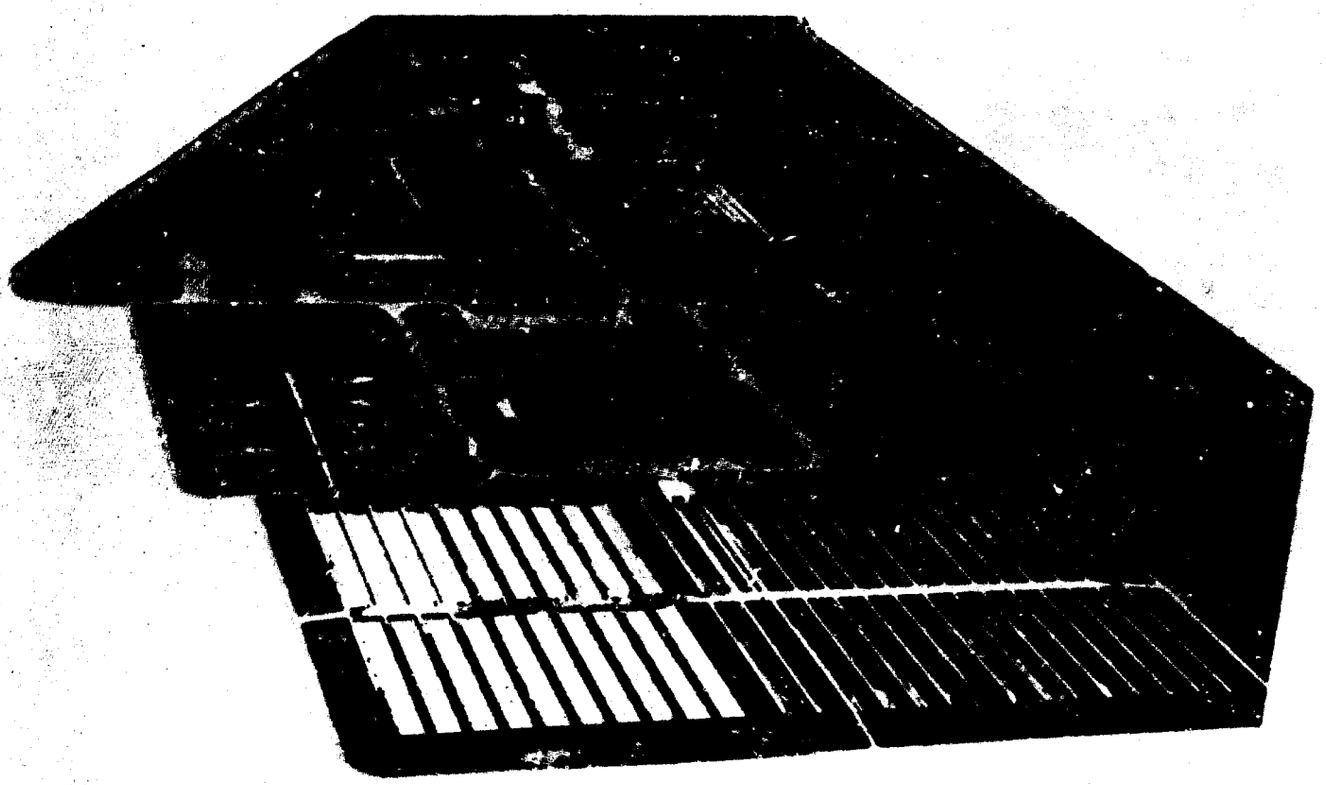


Figure 126

Aerial View of the Sewage Treatment Plant Facility

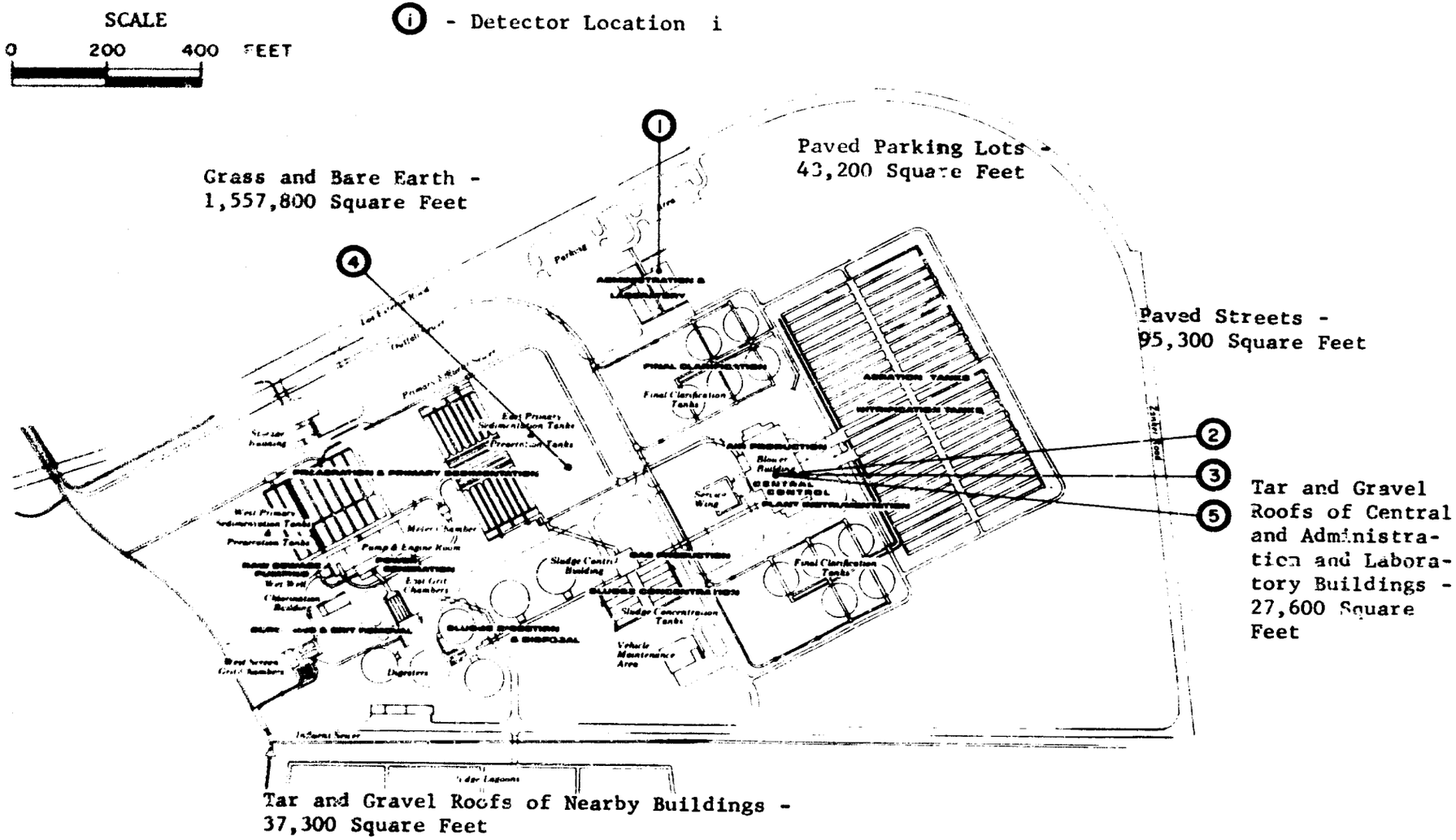


Figure 127

A Map of the Area Around Sewage Treatment Plant Showing the Locations of Detectors and Indicating the Sizes, and Surface Materials of the Potentially Contributing Contaminated Planes

Figure 128

View 1 - Sewage Treatment Plant -
A View of the Central Control Building and the Adjacent Parking Lot

Figure 129

View 2 - Sewage Treatment Plant -
A View of the Central Control Building and the Surrounding Area

Figure 130

View 3 - Sewage Treatment Plant -
A View of the Control Panel in the
Central Control Building

Figure 131

View 4 - Sewage Treatment Plant -
A View of the Pump Well in the Central
Control Building

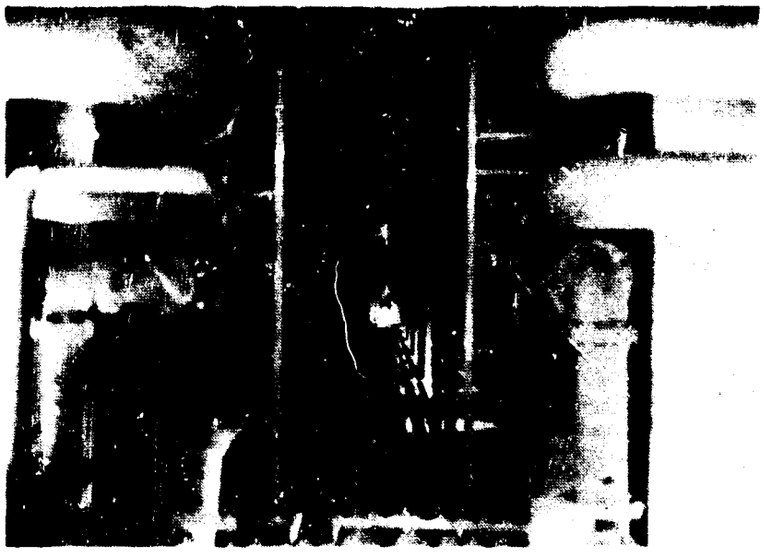


Figure 132

View 5 - Sewage Treatment Plant -
A View of an Underground Tunnel Leading
from the Central Control Building

Figure 133

View 6 - Sewage Treatment Plant -
A View of a Fallout Shelter Area in the
Central Control Building

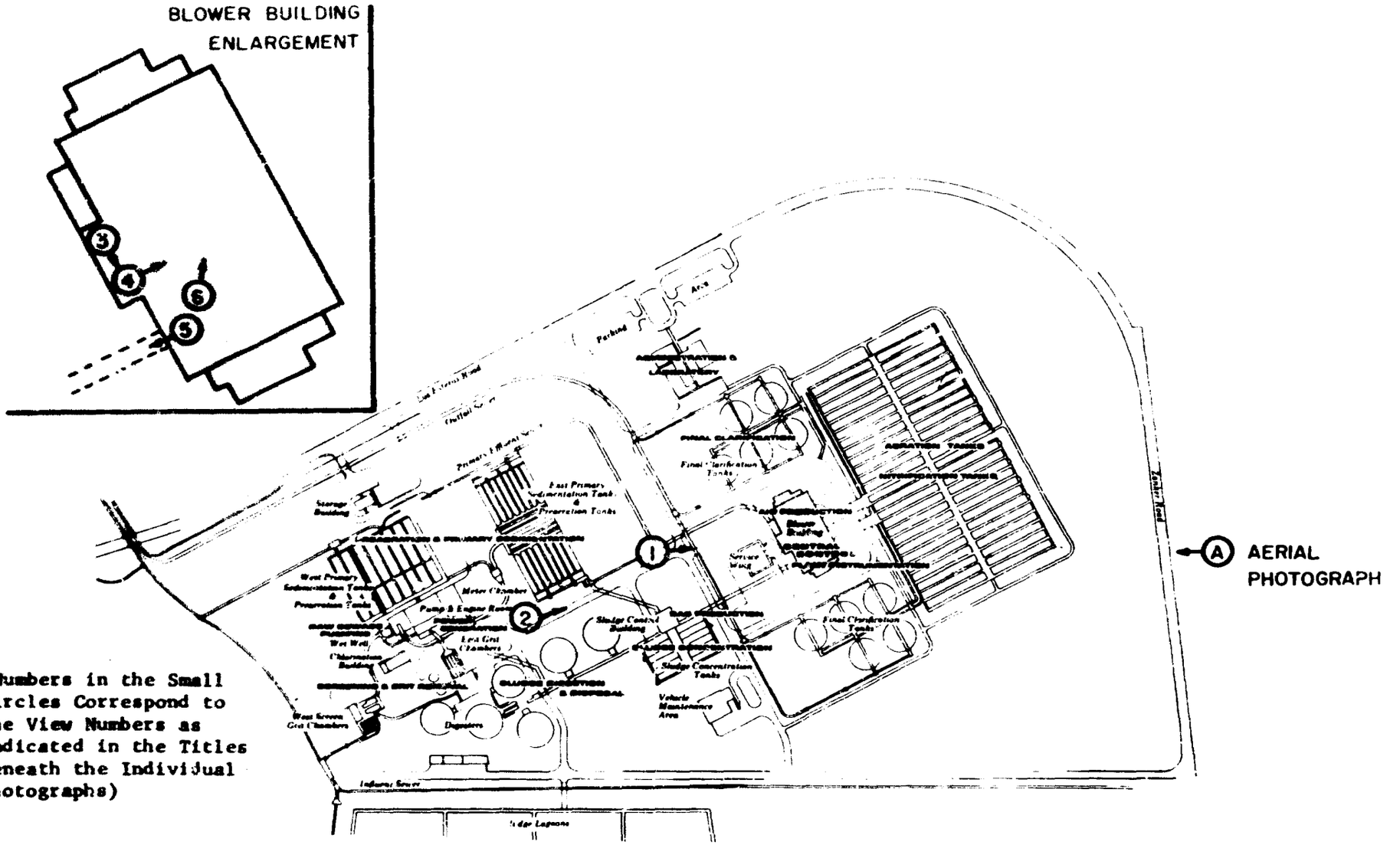


Figure 134

A Map of the Area Around Sewage Treatment Plant Showing the Locations and Directions of the Photographs Shown in Figures 128 through 133

B. Definition of Activities

Five different activity patterns were considered in this analysis. Five detector locations are used to characterize these activity patterns. These detector locations are as follows:

Detector Location	Description
1	Laboratory
2	Central Control Instrumentation Panel (Second Story)
3	Pump Room (First Floor)
4	Outdoor Area
5	Shelter Area

The activities are described entirely according to the amount of time that an activity pattern requires a person to spend at each of the detector locations. Thus, Table XCI describes the five activity patterns.

Table XCI

FRACTION OF TIME AS REQUIRED BY ACTIVITY A_i TO BE SPENT AT DETECTOR LOCATION j IN THE SEWAGE TREATMENT PLANT

Activity Pattern A_i	Detector Location j				
	1 Laboratory	2 Central Control Instrumentation Panel	3 Pump Room	4 Outdoor Area	5 Shelter Area
A_1	.30	.00	.00	.00	.70
A_2	.00	.25	.00	.10	.65
A_3	.00	.30	.05	.00	.65
A_4	.00	.10	.20	.00	.70
A_5	.10	.20	.00	.05	.65

C. Protection Factors

1. Original PF's at Detector Locations (See Figure 116)

	Detector Location	Original PF
1	Laboratory	9.2
2	Central Control Instrumentation Panel	9.4
3	Pump Room	16
4	Outdoor Area	1.5
5	Shelter Area	2000

2. Equivalent Protection Factors for the Activity Patterns

Activity Pattern (See Table XCI)	Equivalent PF
A_1	30
A_2	11
A_3	28
A_4	43
A_5	15

D. Contaminated Planes

Identification Number	Description	Area Size (in ft^2)	Surface Material
1 A	Roofs of Central Control and Administration and Laboratory Buildings	27,600	Tar and Gravel
1 B	Other Roofs	37,300	Tar and Gravel
2	Paved Parking	43,200	Asphalt
3	Streets	95,300	Asphalt
4	Lawn, Bare Earth, etc.	1,557,800	Grass and Bare Earth

E. Contribution to Intensity Factors (C_{ij} Values)

The following gives the structural characteristics of the buildings which were required to calculate the contribution to intensity values:

1. Administration and Laboratory Building

   a. Exterior Walls - 9" cinder block (80 lbs/ft^2)

   b. Roof - 6" reinforced concrete (75 lbs/ft^2)

2. Central Control Building

   a. Exterior Walls

      (1) First story - 13" cinder block (120 lbs/ft^2)

      (2) Second Story - 9" cinder block (80 lbs/ft^2)

   b. Floor - 6" reinforced concrete (75 lbs/ft^2)

   c. Roof - 6" reinforced concrete (75 lbs/ft^2)

Table XCII lists the contribution to intensity factors of the various planes to the selected detector locations.

Table XCII

CONTRIBUTION TO INTENSITY FACTORS (C_{ij} VALUES) FOR THE SEWAGE TREATMENT PLANT

Contaminated Plane i	Detector Location j				
	1 Laboratory	2 Central Control Instrumentation Panel	3 Pump Room	4 Outdoor Area	5 Shelter Area
1A Roof of Building	.0380	.0406	.0058	.0000	.0005
1B Other Roofs	.0000	.0000	.0000	.0000	.0000
2 Paved Parking	.0028	.0024	.0018	.0130	.0000
3 Streets	.0006	.0008	.0006	.0104	.0000
4 Grass and Grounds	.0675	.0632	.0522	.6519	.0000

F. Relative Intensity Contributions (CF_{ij} Values)

The relative intensity contributions at detector location j from contaminated plane i are given in Table XCIII below.

Table XCIII

RELATIVE INTENSITY CONTRIBUTIONS (CF_{ij} VALUES) FOR THE SEWAGE TREATMENT PLANT

Contaminated Plane i	Detector Location j				
	1 Laboratory	2 Central Control Instrumentation Panel	3 Pump Room	4 Outdoor Area	5 Shelter Area
1A Roof of Central Control or Laboratory and Administration Building	.35	.38	.10	.00	1.00
1B Other Roofs	.00	.00	.00	.00	.00
2 Paved Parking	.03	.02	.03	.02	.00
3 Streets	.01	.01	.01	.02	.00
4 Grass and Ground	.62	.59	.86	.97	.00

G. Cost and Effectiveness

The cost and effectiveness data for selected methods of decontaminating surfaces are given in the following table.

Table XCIV

COST AND EFFECTIVENESS DATA FOR SELECTED STRATEGIES OF DECONTAMINATING SURFACES FOR SEWAGE TREATMENT PLANT

Method	Identification Symbol	Surface (Surface Number)	Mass Reduction Factor (Fraction fallout material remaining after decontamination)	Team Hours of Effort	No. in Team
Firehosing	A	Roofs of Central Control, Laboratory &and Administration Buildings (1A)	.03	2.0	7
Firehosing	B	Paved Parking (2)	.03	0.4	5
Grading	C	Grass and Ground (4)	.10	374.0	1

H. RN_j Values

The fraction of intensity remaining for selected strategies is given in Table XCV below.

Table XCV

FRACTION OF INTENSITY REMAINING (RN_j VALUES) FOR SELECTED STRATEGIES FOR THE SEWAGE TREATMENT PLANT

Combined Strategy	Detector Location j				
	1 Laboratory	2 Central Control Instrumentation Panel	3 Pump Room	4 Outdoor Area	5 Shelter Area
A	.66	.63	.91	1.00	.03
B	.98	.98	.97	.98	1.00
C	.44	.47	.22	.13	1.00
A+B	.64	.61	.88	.98	.03
A+C	.10	.10	.13	.13	.03
A+B+C	.08	.08	.10	.11	.03

I. RN_A Values

The activity reduction factors for selected strategies and all activity patterns are given in Table XCVI.

Table XCVI

ACTIVITY REDUCTION FACTORS (RN_A VALUES) FOR SELECTED STRATEGIES AND ALL ACTIVITY PATTERNS FOR THE SEWAGE TREATMENT PLANT

Combined Strategy	Activity Pattern				
	A_1	A_2	A_3	A_4	A_5
A	.65	.89	.65	.77	.82
B	.98	.98	.98	.97	.98
C	.45	.23	.45	.35	.29
A+B	.63	.87	.63	.74	.80
A+C	.10	.12	.10	.11	.12
A+B+C	.08	.10	.08	.09	.10

J. Conclusions

The tunnels connecting the buildings at the sewage treatment facility offer the largest single available shelter area to the surrounding area. However, they were not considered in this decontamination analysis because the tunnels are underground and have an extremely high PF. Therefore, decontamination is unnecessary with respect to detectors or activities taking place in these shelters.

For the detector locations considered, Table XCV shows that combined strategy A (firehosing the roofs of the Central Control and Administration and Laboratory Buildings), B (firehosing paved parking), and C (grading the surrounding grass and ground) leaves a maximum of 11% of the original radiation at any detector location. If a maximum of 13% of the original radiation is acceptable, combined strategy A+C is sufficient.

The most time consuming part of either of the above combined strategies is method C, which requires one man to work approximately 374 hours grading. Grading the ground is necessary because the ground contributes a minimum of 59% of the total radiation to all detectors except the shelter area.

XVIII. SUMMARY AND CONCLUSIONS

In the decontamination analyses reported in this paper, the roofs of most of the facilities offered the major portion of the relative intensity at the various detector locations within the facilities. In all cases, for adequate reduction in radiation (reduction by at least a factor of 5) it was necessary to decontaminate at least the roof of the building under consideration. In fact, for facilities well shielded by structures with roofs higher than the detectors selected, decontaminating the roof alone provided sufficient radiation reduction. The analysis showed further that roof decontamination provided more usable space with regard to effort expended than decontamination of any other plane. Table XCVII, extracted from the relative intensity contribution tables of the facilities analyzed, illustrates the importance of the roof contribution.

Table XCVII

FRACTION OF TOTAL INTENSITY TO VARIOUS DETECTOR LOCATIONS CONTRIBUTED BY THE ROOF OF THE FACILITY

Facility	Detector No. and Description	Fraction of Intensity Contributed by the Roof
California Packing Corp. Plant No. 51		
	1 Dried Fruit Grading Area	.94
	3 Fruit Bins	.96
	5 Store Room	.95
	6 Work Shop	.91
	7 Shipping Department	.89
	8 Shelter Area	1.00
California Pharmaceutical Company	1 Laboratory	.24
Pacific Telephone and Telegraph Co.	1 Long Distance Switchboard	.94
	2 Information Switchboard	.92
	3 Automatic Exchange Equipment Room	.71
		.72
Dole Corp. Warehouse	2 Area A in Warehouse	.91
	4 Area C in Warehouse	.90
San Jose Mercury-News	1 Truck Loading Dock	.62
	3 Copy Room	.98
	4 Type Setting Room	.65
Western Greyhound Bus Lines Depot	1 Ticket Counter	.55
	2 Baggage Room	.55
	3 Main Lobby	.53
San Jose City Lines	1 Repair Area A	.73
	3 Repair Area C	.70
City Corp. Yard	1 Equipment Storage Building	.47
	2 Electrical Shop	.74
	4 Machine Shop	.76
Fire Station No. 8	1 Equipment Storage Area	.23
	2 Alarm Switchboard	.39
Radio Station KXRX	1 Broadcasting Studio	.22
	3 Office	.26
San Jose City Hall	1 City Council Chamber	.71
San Jose Hospital	1 Operating Room (G.F.)	.48
	2 Central Medical Supply Area	.30
	3 Kitchen (G.F.)	.43
	5 Admitting Office (1st Floor)	.96
	7 Patient Room (2nd Floor)	.63
	9 Patient Room (3rd Floor)	.62
	10 Operating Room (3rd Floor)	.94
	11 Nursery (3rd Floor)	.88
	12 Shelter Area (Basement)	.83
Sewage Treatment Plant	1 Laboratory	.35
	2 Central Control Instruction Panel	.38

High velocity firehosing is one of the most efficient methods of decontaminating roofs. Assuming manpower, equipment, and water under sufficient pressure are readily available (which would seem to be the general case), it is also a rapid method of decontamination. In firehosing very large or very high roofs, consideration should be given to the length of hose runs that are necessary.

Paved areas, such as streets and parking lots, may be decontaminated by wet (firehosing and motorized flushers,) or dry (street sweepers and vacuumized sweepers) methods. If mechanized methods are available, they are preferable to firehosing because of their higher efficiency. In particular, firehosing of large paved areas could, generally, present a drainage problem.

If paved streets and parking lots are adjacent to or very near the sites and facilities analyzed, they contribute a greater fraction of the total intensity at the detector locations, and become of more significance in decontamination strategies. However, none of the areas involved (including the shopping center parking lots) were large enough to make decontamination prohibative.

In decontaminating roofs and paved surfaces, the method of decontamination and the mass reduction factor selected become more important as the relative intensity contribution (i.e., the fraction of the total intensity) of the plane under consideration becomes greater. In other words, as the relative intensity contribution decreases, the choice of decontamination method can more heavily depend upon the readily available equipment and manpower with little difference in effectiveness.

If facilities are adjacent to or surrounded by large areas of grass or bare earth, grading or bulldozing becomes an important decontamination strategy. This method was found to be the most time consuming part of any combined decontamination strategy which included it. Considerable judgment should be exercised in determining the necessity for decontaminating a facility or site which requires a large amount of grading.

Three generalizations derived from this study are: (1) as a building becomes

larger or the detector locations are subject to widely varying relative intensity contributions from various planes, decontamination strategies become more complicated, costly, and time consuming; (2) the less shielding afforded a building by surrounding structures the greater must be the area involved in the decontamination strategy; and (3) roof decontamination appears to be a useful strategy more often than any other "simple-plane" decontamination strategy.

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